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EDITED BY A. E. SHIPLEY, M.A., HON. D.Sc., F.R.S.

ASSISTED BY GUY A. K. MARSHALL, F.Z.S., F.E.S.

DIPTERA NEMATOCERA

(EXCLUDING CHIRONOMIDÆ AND CULICIDÆ).

BY

E. BRUNETTI.

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AUTHOR'S PREFACE.

THE present volume, which deals with the Indian NEMATOCERA,* except the CHIRONOMIDÆ and CULICIDÆ, is the first one of the "Fauna of British India" series devoted to the Diptera, although this is an order of insects abundantly represented in every region of the globe, excepting only extreme arctic latitudes and torrid deserts, and even in these latter parts more species are to be found than might generally be supposed.

Yet the study of Oriental Diptera is quite in its infancy, less than 3000 species being known from the whole region as late as 1896. Since that date certain groups have been revised, but the material thus treated has, in nearly every case (except the mosquitos), been drawn from but a limited section of that zoological region. The CULICIDÆ is the only family that has been extensively studied from any considerable number of localities within the limits of the "Fauna" series.

It would not be unreasonable to estimate the existing species of the more conspicuous families (such as TABANIDÆ, BOMBYLIIDÆ, ASILIDÆ, SYRPHIDÆ, and the more showy MUSCIDÆ) at not less than double the number of those already recorded; whilst in the more obscurely coloured groups (as, for example, the CHIRONOMIDÆ, MYCETOPHILIDÆ, EMPIDÆ, and the more sombre MUSCIDÆ), the existing species may outnumber the known ones by many times. The MUSCIDÆ are mainly obscurely coloured or else the species are very difficult to differentiate, which probably accounts for the general neglect of this family. Yet the family contains about a third of all known Diptera.

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* [The author has used the word NEMOCERA throughout his manuscript, but it has seemed advisable to adopt the more correct form, NEMATOCERA, which is now more generally used by dipterologists.—ED.]

Many new species in the families at present treated of will with certainty be discovered, but it seems reasonable to assume that for some little time to come the wants of the Indian student in the groups monographed herein will be tolerably well met in these pages.

The bulk of the present material forms an integral part of the Indian Museum collection, and it is directly due to my familiarity with that collection that this volume has been rendered possible. My thanks are therefore freely tendered to Dr. Annandale, the indefatigable Superintendent of that Institution, and to his co-directors, since it has been at his instigation that I have obtained the necessary knowledge. My heartfelt thanks are also due to the following gentlemen who have most kindly supplied me with much valuable information respecting the types of TIPULIDÆ that are contained in European Museums *:—Dr. A. Handlirsch (Vienna Museum); Prof. R. Gestro (Genoa Museum); Dr. J. C. de Meijere (Amsterdam Museum); Mr. Ritsema (Leyden Museum); Mr. C. Hill (British Museum); Dr. A. Brauer (Berlin Museum); Mr. Lundbeck (Copenhagen Museum); and Mr. Bedot (Geneva Museum).

To the Directors of the Pusa Agricultural Research Institute thanks are also due for the loan of specimens for examination, through the kindness of Mr. F. M. Howlett, and the gift of a certain number of cotypes for my own collection; also to Mr. A. D. Imms, of the Muir Central College, Allahabad, for the loan of specimens which, although not numerous, comprised a number of new species. Special thanks are due to Mr. E. E. Green for his untiring energy in collecting the Diptera of Ceylon and presenting a number of types of new species to the Indian Museum (as Mr. Howlett

* This information has already been included in a previous paper of mine ("Revision of the Oriental Tipulidæ," Records of the Indian Museum, vi, pp. 231-314, 1911), but that paper was practically a basis for the present more exhaustive work.

and Mr. Imms have also done), thus affording me the great advantage of having practically all the known Indian species before me simultaneously whilst describing.

A large proportion of the new species have been collected by Dr. Annandale and Mr. Green, and a considerable number by Mr. C. Paiva of the Indian Museum. Owing to this fact the types of six-sevenths of the recorded species have been under my personal examination, for out of over four hundred species dealt with in this volume only about sixty have been described by other authors. The previously recorded species have been identified by me from descriptions only, except in a few instances in which my identifications have been corroborated by comparison with types.

As regards the use of the words "type," "cotype," and so on, there seems no necessity to discuss the various terms with their exact meanings here, in view of the different opinions of zoologists on this subject; and more especially as the simple terms "type" and "cotype" fulfil all the requirements in this work. Yet a few remarks to avoid ambiguity to the student, and that he may at least understand the senses in which the terms are understood by me, may be pardonable. Personally, when describing a new species, of which several specimens of each sex are present. I select one male and one female which, (1) embody the whole or the bulk of the characters of the species, (2) are in as perfect condition as possible, and (3) from their mounting allow the best view of all parts of the body.

These two specimens are termed the type male and type female, and whenever both sexes are present, *the type* male *is always the type of the species.* All other specimens present before me at the time of describing are termed *cotypes.* When only one sex is present, the type specimen may be male or female. In the event of two species being described under the impression that the specimens represented the two sexes of a single species, the *name of the species must invariably be*

retained for the male, which takes precedence of the female, and a new name would have to be found for the latter.

It has always been my endeavour to describe the *species* and not merely the type specimens, as is too often done.

In proposing the term "*neotype*" (or "new" type) it may be that an original suggestion is being made, as I am not aware that it has previously been proposed. It is intended for use when the original type is lost and a new one is set up, either from amongst the original cotypes or otherwise; and selected either by the author of the species or by a competent specialist. If selected from cotypes or chosen by the author of the species from other specimens, a neotype should practically be of equal value with the original type; but a neotype set up by any other person than the author might by some entomologists be ranked as of rather less value. The only occasion when it has been necessary in this work to employ the word is in the case of *Simulium indicum,* Becher, where I have selected one of the original specimens from which the description was drawn up, to represent the type of the species.

There still remains a limited residuum of small, obscure, or mutilated specimens of TIPULIDÆ and MYCETOPHILIDÆ, which from their uncertain specific distinctness or unsatisfactory condition have not been referred to in these pages. These may be worked out later on with further material.

In conclusion it is only necessary to say that every care has been given to make the present work as complete as possible; and if I am honoured with the preparation of any further volumes, I would express the hope that they may be written in Europe, since, to any one possessed of nerves, the inconveniences and irritations of India render scientific work exceedingly difficult.

E. BRUNETTI.

Calcutta, December 1911.

GLOSSARY.

Acalyptrata.—One of the two great subdivisions of the MUSCIDÆ, comprising those species in which the squamæ are of equal size or nearly so, or absent. They embrace twenty or more groups which are taxonomically subfamilies only, but on account of their magnitude are by some authors regarded as families. See *Calyptrata.*

Acephala or acephalous larvæ.—Those in which there is no differentiated head; as opposed to the EUCEPHALA.

Acetabulum.—The minute joint attaching the coxa to the body.

Acroptera.—Brauer's third division of the ORTHORRHAPHA BRACHYCERA, consisting only of the LONCHOPTERIDÆ. Considered by him a super-family.

Aculeus.—A term used in Hymenoptera to denote the sting of such insects as bees and wasps, but since no Diptera are aculeate, the term has been employed by certain of the older authors to define part of the genital organs. See *Style.*

Adminiculum.—Westhoff's name for the variously structured guard of the penis in TIPULIDÆ.

Aerial dancing.—Applied to the habit of many species of Diptera and other orders of forming small clusters in the air, usually beneath the lower boughs of trees or over streams, and flying mainly up and down with considerable swiftness. This habit is somewhat different from that known as "hovering" (*q. v.*), and, at least as regards Diptera, seems to be chiefly confined to the males; moreover, they appear most addicted to the practice towards sunset.

Alula.—The anal lobe of the wing proper, and not to be confounded with the squamæ, or tegulæ. Many authors (including myself in my earlier notes) have erroneously used the term to denote the squamæ (p. 15).

Ambient vein.—The very fine vein running round the hind margin of the wing from the end of the costa to the base.

Amphipneustic.—Larvæ with spiracles on the first and last segments only.

Anal cell.—The cell behind or posterior to the 5th longitudinal vein when that is present (p. 14).

Anal vein.—The 6th longitudinal vein, having theoretically in front of it the anal cell, and posterior to it the axillary cell.

Antennal grooves or *foveæ.*—A longitudinal groove or pair of grooves in the middle of the frons, for the reception of the antennæ, bounded on each side by the facial ridge.

Anterior legs.—The *four* front legs taken together, the first pair only being termed the *fore* or *front* legs.

Antigeny.—A term sometimes used to denote sexual dimorphism.

Antisquama. } See *Squamæ.*
Antitegula. }

Apex, apical.—The part of an organ, segment, etc., which is most distant from an imaginary point lying between the thorax and abdomen of an insect, such as the tip of the abdomen, the last joint of the leg, antenna or palpus. Opposed to base, basal.

Arista.—The terminal bristle, sometimes very long, on the last joint of the antenna. Occasionally it is two-jointed, but this is perceptible only under high magnification. It is practically absent in the Orthorrhapha, though quite general in the Cyclorrhapha. In only one very small family (the Orphnephilidæ) of the Nematocera is there any approach to it; the antennal flagellum in this group being aristiform. The arista may be pectinate (*i. e.* with strong hairs, few in number, on its upper and lower sides), pubescent, or plumose (when the hairs are long and placed closely together, forming so to speak a large feather). In nearly all such cases the hairs are more abundant on the upper-side. In many groups it is quite bare.

Axillary cell.—See pp. 8 and 15.

Axillary vein.—The 7th longitudinal vein, or when the venation is reduced it is applied to the vein behind the anal vein, but in many cases it is absent.

Barba, or *beard.*—Practically absent in the Nematocera. The long hair on the lower side of the face and head, conspicuous in the Asilidæ; often joined without interruption to the *mystax* * or the hair on the cheeks. The older authors used the term mystax or barba for all the hair on the head below the level of the antennæ.

Base, basal.—Applied to that portion of an organ, segment, etc. which lies nearest to an imaginary point between the thorax and the abdomen of an insect; as opposed to distal, apical, and apex.

Bombylimorpha.—A superfamily used by Brauer and Bezzi for the Cyrtidæ (Acroceridæ) and Nemestrinidæ together.

Brachycephalous.—Having the head wider than it is long.

Callus, calli.—More or less distinct swellings on various parts of the body, generally on the thorax; in some families (especially in Tabanidæ) on the frons or vertex. (See p. 5.)

Calypter, calyptron.—See *Squamæ*; also p. 16, note.

Calyptrata.—A division of the great family Muscidæ, embracing about half the known species, including all those in which the squamæ are large, easily visible, and distinctly different in size; as opposed to the Acalyptrata, in which they are very small, practically equal in size (the upper and lower scale), or absent. The Calyptrata comprise the Tachininæ (including the Dexinæ and Sarcophaginæ), Muscinæ and Anthomyinæ. See *Acalyptrata.*

Cells.—For full description, see pp. 8 and 13.

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* Literally, moustache.

Central vesicle or *vesicula centralis.*—The large bulbous basal portion of the penis in TIPULIDÆ.

Cephalic.—Appertaining to the head.

Chætotaxy.—The arrangement of the prominent spines and strong bristles present on various parts of the body in many groups of Diptera. They are very valuable classificatory characters, and are named in accordance with the parts of the body on which they are placed, cephalic, thoracic, abdominal, and so on. Those on the sides of the thorax are known as pleural bristles, whilst most of the well-defined and constant ones on other parts of the body have their special names. As, however, none of the NEMATOCERA possess bristles of chætotactic magnitude it is unnecessary to describe them in full here. They reach their maximum probably both in size and importance in the ASILIDÆ and MUSCIDÆ.

Cheeks, or *genæ.*—The sides of the lower part of the head below the eyes and on each side of the mouth.

Chitine.—The substance of which the hard parts of the outer covering of insects is composed.

Cinereous.—A light grey colour, but not so pale as ash-grey. Ridgway * illustrates it as too dark, to my thinking; his No. 6 "grey" being more my own opinion of the term.

Claws.—See *Ungues.*

Clypeus.—This is probably present only in those Diptera with highly developed mouth-parts. It is an upper transverse piece, and most obvious in such groups as the TABANIDÆ.

Coarctate.—A term used to designate those pupæ of insects in which the future parts are unrecognizable from the exterior surface.

Cocoon.—The outer covering of silk, or similar substance, formed by the larvæ of many insects, in which they pass the pupa state.

Collare.—Osten Sacken's term for the disc-shaped prothorax in many TIPULIDÆ.

Collum.—The neck.

Costa.—Technically, the entire marginal vein of the wing from base to base, but usually employed in Diptera to denote the anterior margin only from the base to the extreme tip. In some genera this vein, the *costal*, actually terminates somewhere near the wing-tip, its place then being taken by the *ambient vein* for the remainder of the marginal distance.

Costal cell.—The cell immediately below the *costa* or *costal vein.* See pp. 8 and 13.

Cotyloid cavity.—The opening in the thorax of insects which receives the head of the first joint of the leg, namely, the acetabulum, or if this be absent, the coxa.

Coxa.—The first easily seen joint of the legs, but it is actually attached to the thorax by a very minute joint known as the acetabulum. The coxæ are very greatly developed in many groups of Diptera, notably in some of the MYCETOPHILIDÆ amongst the NEMATOCERA.

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* 'A Nomenclature of Colors for Naturalists' (Boston, 1886).

Cross-veins.—Veins perpendicular, more or less, to the longitudinal axis of the wings. They are termed the humeral, subcostal, marginal, anterior, posterior, and discal; whilst in one subfamily of TIPULIDÆ is found a special cross-vein which I have designated the costal.

Cubital vein.—A name applied by the older authors to the 3rd longitudinal vein.

Cyclocera.—Schiner's and Brauer's term for the NOTACANTHA and TANYSTOMA taken together.

Dermatina.—"Eremochætous species in the sense that there are no strong bristles on any part of the thorax or scutellum" (*Verrall*). Verrall's name for the SCENOPINIDÆ and MYDAIDÆ taken together.

Dichoptic.—Applied to the head when the eyes in the male are separated by a distinct more or less broad frons; as opposed to *holoptic*.

Discal cell.—The conspicuous cell near the centre of the wing in a large number of Diptera (p. 8).

Discal vein.—Some of the older authors spoke of the 4th longitudinal vein under this term.

Distad.—Away from, the body or the base of any part; as opposed to proximad.

Distal.—Nearer the outer extremity than to the body or to the base of any organ.

Divaricate.—Applied to the habit of some insects of resting with the wings (and often the legs also) stretched out flat on the surface of the object; as opposed to those which fold the wings over the abdomen when at rest. Used by many authors in writing on TIPULIDÆ.

Diverticulum.—The sucking stomach in Diptera.

Dolichocephalous.—When the head is longer than it is wide.

Empodium.—"A median appendage on the underside of and between the claws, either in the form of a pad, like the pulvilli, when it is called pulvilliform, or like a bristle or spine; rarely it is alone present and the pulvilli wanting" (*Williston*).

Energopoda.—A superfamily. "Chætophorous species in the sense that there are strong and usually numerous bristles on the scutellum and legs; or at least on the sides of the mesonotum; except in the few cases in which dense coarse pubescence is substituted" (*Verrall*). Verrall's name for the APIOCERIDÆ and ASILIDÆ. Osten Sacken also included DOLICHOPIDÆ, EMPIDÆ, and LONCHOPTERIDÆ, and was inclined to admit also PHORIDÆ into the same group.

Epipharynx.—A narrow piece lying immediately below the labrum or upper lip in those kinds of Diptera with a highly developed mouth. Between these two parts, which form a long tube, the insect sucks up moisture from flowers, the blood of animals, or other sustenance.

Epistoma, epistome.—The mouth-opening and its immediate vicinity: often used by the older authors to signify practically all the lower part of the head below the eyes, except the palpi and any specially developed part of the proboscis.

Eremochæta.—A superfamily in which Osten Sacken included the STRATIOMYIDÆ (with XYLOMYINÆ), TABANIDÆ, ACANTHOMERIDÆ, and LEPTIDÆ (with XYLOPHAGINÆ and CŒNOMYINÆ). Verrall adds to these the NEMESTRINIDÆ and CYRTIDÆ.

Eremochætous.—A term applied to those Diptera absolutely without any strong bristles on the head or thorax, as distinct from ordinary pubescence or such as the bristly hairs in PSYCHODIDÆ.

Eucephala.—Those larvæ possessing a distinct head; as opposed to the ACEPHALA.

Extricate.—Applied to pupæ in which, from their mummy-like facies, the outlines of the future imago are more or less distinctly seen.

Face, facies.—The term *face* is restricted to that part of the front of the head below the antennæ and enclosed by the cheeks and the upper margin of the mouth. In many cases a well-defined line, ridge or bend in the surface distinctly delimits the face; at other times the limits are formed by imaginary lines drawn between the points specified. *Facies* literally means the face proper, as above described, but is never used in that sense, being employed to signify the general appearance of the whole insect.

Facial ridge.—The sides of the antennal foveæ.

Fascia.—A transverse mark which is more or less irregular in outline, generally with ill-defined edges.

Feet.—Some of the older authors, as late even as Walker and (sometimes) Osten Sacken, used this term to signify the whole of the legs, but it should strictly be applied to the appendages of the last tarsal joint. The feet of Diptera consist of (1) two *ungues* or claws (movable curved opposable hooks), (2) the *pulvilli*, or two pad-like fleshy cushions, and (3) the *empodium*, a median appendage varying in form from an additional pad to a spiny process. Sometimes the empodium is pulvilliform, occasionally the pulvilli are absent, or modified.

Femur.—The first conspicuous long joint of the legs, nearly always the strongest of all; preceded by the coxa and the very small connecting joint between these two called the trochanter, and followed by the tibia.

Ferruginous.—A reddish brown with more or less of a yellowish tinge; rust-colour. Walker describes the word as "rusty yellow." Ridgway gives it as "light burnt sienna."

Flagellum.—The joints of the antennæ after the basal two (which latter are known as the scape). In the NEMATOCERA they are nearly always differently shaped from the scapal joints, and very variable in form (p. 21).

Forceps.—The term employed by Osten Sacken and some others for the male genitalia in such families in which they are conspicuous, complex and formed mainly of a pair of distinct claspers to which various appendages are attached.

Fovea, foveæ.—See *Antennal groove.*

Frenulum.—A name suggested by Loew for what is generally known as the scutellar ridge.

Frons, or *front*.—The space that lies between the eyes (viewed from in front), limited above and below respectively by the vertex and a line drawn through the roots of the antennæ. The demarcation between the vertex and the frons may be sharply defined by a sudden angle in the surface, a difference of colour, or there may be no line of distinct separation. In *Bibio*, for instance, the vertex and frons are practically united and inseparable owing to the flatness of the head.

Frontal lunule.—A crescent-shaped or oval space immediately above the base of the antennæ, between them and the transverse slight depression known as the frontal suture. This lunule is frequently indistinct, probably often quite absent, although its presence is the only technical means, according to Brauer, of determining in the imago state whether a given individual belongs to the CYCLORRHAPHA. It is prominent in the MUSCIDÆ, but indistinct or absent in the other three families of the CYCLORRHAPHA, *viz.*, SYRPHIDÆ, PIPUNCULIDÆ, and PLATYPEZIDÆ,* though Verrall thinks it traceable in certain peculiarities in the structure of the head in these three families.

Frontal suture.—An impressed line, or very shallow narrow groove of crescent shape enclosing the frontal triangle or frontal lunule. Theoretically present in all Cyclorrhaphic flies, but inconspicuous or absent in three families out of the five. Skuse calls it the frontal fissure.

Frontal triangle.—The small triangle (with the apex upwards) immediately above the base of the antennæ, caused by the divergence of the eyes from one another below their region of contiguity. It therefore can only occur in holoptic or sub-holoptic Diptera.

Fulvous.—Golden yellow.

Genæ.—The cheeks (*q. v.*)

Genitalia.—The organs of generation. In the male they are technically known as the *hypopygium*, in the female as the *ovipositor*.

Glabrous.—Osten Sacken uses this term to define bare eyes in TIPULIDÆ. It is also used in connection with descriptions of wings, meaning smooth and shining.

Gonapophyses.—"Four free rods that arise from the wall of the genital chamber, two above and two below the base of the penis, and project backward within the chamber" (*Snodgrass*).

Halteres.—The "poisers" of the older school of authors, and "balanciers" of French writers. The atrophied hinder wings in Diptera, reduced to a narrow short stem with a more or less distinct club at the tip. They are placed behind and below the wing, one on each side of the thorax.

Hemicephalous.—A term used by Dufour and others for those Dipterous larvæ in which the head is not sufficiently differentiated to include them in the EUCEPHALA, yet sufficiently obvious to withdraw them from the ACEPHALA.

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* Technically it should be present in these families also, if Brauer's theory be accepted, and its absence seems to weaken considerably its value as a taxonomic character.

Heterodactyla.—The second of the two divisions into which Brauer divides his PLATYGENYA, which latter is the first division of his ORTHORRHAPHA BRACHYCERA.

Holoptic.—Used of the head when the eyes are contiguous; opposed to dichoptic. Generally a character of the male sex only, but exceptions occur in several families.

Homœodactyla.—One of the two divisions into which Brauer divides his PLATYGENYA. See *Heterodactyla.*

Hovering.—This term expresses the habit of some flies of remaining quite stationary in the air, then suddenly darting away a short distance and again remaining stationary.

Humerus.—The shoulder or anterior corner of the thoracic dorsum; when it takes the form of a more or less distinct bump it is known as the *humeral callus.*

Hypocera.—The name given to a superfamily consisting only of the PHORIDÆ.

Hypopleura.—The pleural area between the metapleura and the hind coxæ.

Hypopygium.—The male genital apparatus as a whole, as distinct from that of the female.

Imaginal disks.—Centres of the formative tissue in the larvæ of certain insects especially Diptera, which give rise to the legs, wings, etc.

Intercalary veins (Loew).—The lower prongs of the upper and lower branches respectively of the 4th longitudinal vein (p. 12). The term has been used by subsequent authors for various veins, but without obtaining general acceptance.

Johnston's organ.—A minute structure in the 2nd antennal joint of Diptera which is supposed to contain the auditory nerves.

Labella.—A pair of organs, generally more or less oval or rounded, nearly always at the tip (occasionally at the middle) of the proboscis.

Labium.—The lower lip. In Diptera always the lowest part of the proboscis, and constructed, in the most highly developed forms, more or less like a groove or case in which the remaining parts can be folded and covered by the labrum.

Labrum.—The upper lip, the uppermost part of the proboscis in Diptera.

Lamella, lamellæ.—Small leaf-shaped extremities to the ovipositor in the female. A general term also for an oval or leaf-shaped flattened terminal or projecting process.

Lamella basalis supera and *lamella basalis infera.*—Westhoff's names for the upper and lower sides respectively of the 8th abdominal segment. He terms the upper and lower sides of the 9th segment (namely, those actually forming the genitalia) *lamella terminalis supera* and *infera*, but the terms have not been adopted by other authors.

Macrochætæ.—The large strong bristles in Diptera distributed over various parts of the body, which are constant and possess a very high taxonomic value. The study of this subject is termed *Chætotaxy.*

Marginal cell. }
Mediastinal cell. } See pp. 8 and 13.

Mediastinal vein.—Identical with the auxiliary vein, that is to say, the first vein below the costa; also known as the subcostal vein, but some authors (including Verrall) employ the term subcostal for the 1st longitudinal vein. This appears illogical to the present author, since the very name subcostal suggests a position immediately beneath the costa.

Mesopleura.—The pleural area immediately in front of and slightly below the roots of the wings.

Metanotum.—The hindermost portion of the thorax, situated directly below the scutellum, highly developed in some families of NEMATOCERA, especially the TIPULIDÆ.

Metapleura.—The pleural area immediately behind and slightly below the root of the wings.

Metapneustic.—Used of larvæ in which the spiracles are confined to the posterior segments only.

Metatarsus.—The 1st joint of the tarsus, that is to say the one adjoining the tibia, the following joint of the tarsus being the *second.*

Microchætæ.—The smaller bristles in Diptera, distinct from pubescence or hairs, but not of sufficient size or importance to rank as macrochætæ, and therefore of much less taxonomic value.

Microphona.—Verrall's name for the EMPIDÆ and DOLICHOPIDÆ.

Mystax.—The "moustache"; strictly applied to the long hairs on the cheeks; seldom, if ever, present in the NEMATOCERA, most conspicuous in the very pubescent groups of BRACHYCERA, such as ASILIDÆ, BOMBYLIIDÆ, etc. See *Barba.*

Neuration.—The older authors' name for venation.

Nile blue or *Nile green.*—A somewhat pale shade intermediate between blue and green.

Notacantha.—Brauer's term, used by other authors also, for the STRATIOMYIDÆ, "XYLOPHAGIDÆ" (regarded erroneously as a family) and CŒNOMYIDÆ. A superfamily, in the view of such authors.

Nymph.—The name applied to the pupa when it is active and not fixed.

Obtectæ.—Applied to those pupæ that show no sign of the shape of the future imago.

Occiput.—The hinder surfaec of the head.

Ocellar triangle and *ocelli.*—The simple eyes in Diptera (or other insects) are placed on a triangular spot on the vertex of the head, which is generally elevated (sometimes considerably so) above the surface, called the ocellar triangle, the ocelli being placed at each corner of it, when there are three. Sometimes there are two only, sometimes they are absent, but in no instance are there more than three. In some families they are well separated (MYCETOPHILIDÆ), when they are placed directly on the frons, in the form of a more or less flattened triangle, or in an absolutely straight line. As a rule they are very constant characters when present.

Ochraceous.—Of the eolour of brown ochre with an admixture of yellow.

Orbit.—The margins of the large compound eyes, whether such are distin-

guished by a distinct ring, ridge, or well defined space, or not. The frontal orbit is that part of the orbit immediately abutting on the frons.

Orthocera.—Schiner's and Brauer's name for the BOMBYLIMORPHA, PROCEPHALA, and POLYTOMA. Schiner, however, includes LEPTIDÆ in the ORTHOCERA.

Orthogenya.—Brauer's second division of his ORTHORRHAPHA BRACHYCERA, composed only of EMPIDÆ and DOLICHOPIDÆ.

Ovate.—Egg-shaped, that is, an ellipse more pointed at one end than the other.

Oviposition.—The act of depositing eggs by the female.

Ovipositor.—The female genital organs, as distinguished from those of the male.

Palpi, palpus.—These organs in the Diptera possess from one to five segments; the vast majority of Brachycerous flies having only one segment, and the NEMATOCERA four. In many groups they are rudimentary, in others absent (p. 19).

Pectinate.—When the vestiture of the antennæ is stronger than stiff pubescence or verticillate hairs and takes the form of stiff bristles, or branched pendulous or variously formed solid projections, they are termed pectinate.

Pectus.—The breast. Walker used it to denote the lower anterior part of the thorax. Modern authors do not, I believe, employ the term.

Peripneustic.—Larvæ with spiracles on the median segments, as well as at the head- and tail-ends, are so called.

Peristoma, or *peristome.*—Apparently a synonym of epistoma.

Piceous.—Blackish brown; pitch colour.

Pile.—A very closely set and very short pubescence of erect hairs resembling the "pile" of velvet.

Platygenya.—Brauer's first division of the ORTHORRHAPHA BRACHYCERA, comprising all the families except the EMPIDÆ, DOLICHOPIDÆ, and LONCHOPTERIDÆ.

Pleuræ.—The sides of the thorax are in many Diptera separated into fairly distinct divisions by two sutures running longitudinally to the axis of the body, and by one perpendicular or transverse suture. The upper suture is the *dorsopleural* (or more correctly *notopleural*); the lower longitudinal suture is the *sternopleural.* The vertical suture (though it is seldom either straight or absolutely vertical) is the *mesopleural.* The pleuræ (or spaces) are named the *propleura* (or *prothorax*), *mesopleura*, and *pteropleura*, the two latter divided from each other by the mesothoracic suture. Below the sternopleural suture are, the *sternopleura* (in front) and the *hypopleura* (above the middle and hind coxæ). The *metapleura* is a more or less indistinct space behind the pteropleura and hypopleura, and adjacent to the metanotum.

Plumbeous.—Leaden colour, which may be dull or shining.

Poisers, or *balancers.*—The older authors' terms for the halteres.

Pollinose.—An expression used to define a surface with a light dust-like covering, resembling pollen; a finer vestiture even than tomentum.

Polytoma.—Brauer's (and Bezzi's) name for a superfamily consisting of the THEREVIDÆ and SCENOPINIDÆ.

Porrect.—Projecting straight forwards; applied to antennæ or palpi.

Post-alar callus.—A more or less distinct, rounded swelling situated between the root of the wing and the scutellum, often inconspicuous or absent.

Posterior legs.—The hindermost four taken together, the last pair only being termed the hind legs.

Postical vein.—The 5th longitudinal vein.

Præfurca.—The portion of the 2nd longitudinal vein lying between its origin and its forking. This is the sense in which Osten Sacken employs the term and in which it is used in the present volume, but Verrall uses it in the BRACHYCERA to denote "the common origin of the 2nd and 3rd veins," in other words for only that portion of the 2nd vein between its origin and the origin of the 3rd vein.

Pre-alar callus.—A more or less distinct, rounded swelling in front of the root of the wing, on the side of the mesonotum, just behind the outer ends of the transverse suture.

Pre-sutural depression.—A quite small depression, generally triangular in shape, situated at each end of the transverse thoracic suture, close to the commencement of the dorsopleural (notopleural) suture.

Procephala.—Brauer's name for the superfamily containing the MYDAIDÆ, ASILIDÆ and BOMBYLIIDÆ; Bezzi also adopts it.

Propygium.—Bergroth's name for the hypopygium.

Prothorax.—The anterior part of the thorax, in Diptera often indistinctly marked off from the main middle part or mesonotum.

Proximal.—Nearer to the body of the insect, the base of a wing or leg, and so on; as opposed to distal, distad. Proximad is the corresponding adverb.

Pseudotracheæ.—Radiating ridges on the inner opposable sides of the labella in many Diptera, which "serve as a means of attrition, by which the insect rubs off particles of food from firm substances" (*Williston*).

Pteropleura.—The pleural area immediately below the root of the wings.

Ptilinum.—A small but powerful bladder-like organ, present in the CYCLORRHAPHA only, situated just above the base of the antennæ on the frons. It is only used by the insect to escape from the puparium, by inflating it, upon which it protrudes through the frontal suture and springs off the cap of the puparium.

Pubescence.—The clothing of soft hairs common to nearly all Diptera in different degrees, not short or dense enough to be known as pile, nor containing bristles.

Pulvilli.—"Two pad-like fleshy cushions attached to the last joint of the tarsus below the claws, usually present, but often absent among the ORTHORRHAPHA, and often much larger and better developed in the ♂ than the ♀" (*Williston*).

Puncture.—A minute indentation of the surface.

Radical cell.—A term used by a few of the older authors for the basal cells.

Rhomboidal cell.—A small four-sided cell near the end of the costa in TIPULIDÆ. At first Osten Sacken called it the trapezoidal cell.

Rostrum, or *snout*.—The usual, more or less cylindrical, anterior prolongation of the head that projects over the proboscis proper, most conspicuous (amongst the NEMATOCERA) in TIPULIDÆ. Probably some of the older authors used the term to include both the rostrum proper and the proboscis also.

Scape, or *scapus*.—The first two (or basal) joints of the antennæ, nearly always differentiated from the rest. In the NEMATOCERA, the 2nd joint is generally much shorter than the 1st, and the 1st joint of the flagellum (*i. e.*, the remaining joints taken together) is usually longer than the others. The scape is in nearly all cases sufficiently obvious.

Scutellar ridge.—A sometimes very conspicuous hardened ridge joining the sides of the scutellum to the thorax. Often inconspicuous or absent. Loew has suggested for it the name "frenulum."

Scutellum.—The semicircular or crescent-shaped small piece affixed to the hinder margin of the thoracic dorsum. It often bears important bristles or spines, though less frequently so in the NEMATOCERA than in some other groups.

Seta.—Applied to a somewhat long bristle-like hair. It is also used to designate the microscopic stiff hairs with which many wings are covered, and which are invisible to the naked eye.

Setigerous.—Provided with setæ.

Spurious cell.—See p. 15.

Squamæ.—The most correct term for the scale-like organs (one covering the other, either equal in size or the lower one much larger than the upper) found at the root of the wings in the higher Diptera. The upper or anterior one is fixed to the base of the wing behind the alula and is most correctly termed the *alar squama* or *squama alaris*; the hinder or posterior one, which in all the higher groups of MUSCIDÆ and other families is always much larger than its companion, is attached to the thorax and is therefore most correctly called the *thoracic squama* or *squama thoracis* or *thoracicalis*. The presence or absence of these organs gives the distinguishing names of CALYPTRATA and ACALYPTRATA, dividing the MUSCIDÆ (*sensu lato*) into two great groups, above subfamilies and approximately of equal extent. The line of demarcation, however, is not absolute, many small ANTHOMYIDÆ having squamæ of equal size and very little larger than those found in the ACALYPTRATA, in which group, moreover, exceptions with squamæ of comparatively large size are found. Some authors call them tegulæ, calypters, or (erroneously) alulæ.

Sternopleura.—The pleural area forming the lowest part of the ventral surface of the thorax, developed chiefly between the fore and middle pair of legs.

Sternum.—The lower surface of the thorax.

Sternites.—The plates on the lower surface on the body of an insect, but here specially used to denote the ventral plates of the abdominal segments, the numbers of which are counted from the base outwards; opposed to *tergite*.

Stigma.—This is used in two distinct senses: (i) In the wings of many Diptera is a more or less clearly defined, darkened (generally yellowish, brown

or black) spot of oval or some such shape, towards the costal margin, a little or considerably beyond the middle of the wing, bounded usually by the auxiliary and 1st longitudinal veins. This is the stigma in the most ordinary sense of the word, as used by systematists. (ii) Four very small apertures, easily overlooked, generally situated each at the bottom of a small pit, are termed the prothoracic and metathoracic stigmata respectively. The former are placed, one on each side, below the shoulders towards the front; the latter, immediately in front of the halteres. The prothoracic stigma is by some called the mesothoracic. These stigmata or spiracles serve for the admission of air to the respiratory system.

Style.—Used in two senses: (i) The elongate, conical, blunt or pointed solid appendix to the ultimate joint of the antennæ, as opposed to the *arista* (*q. v.*). (ii) Osten Sacken's name for "a single immovable styliform organ," visible immediately below the genital organs in LIMNOBIINI. Not seen in other groups in the same form, but replaced by the *aculeus*, "a slender, horny, often curved and pointed piece, which is entirely concealed when the forceps is closed and projected when it is open" (*Osten Sacken*).

Subapical cell. } See pp. 8 and 13.
Subcostal cell. }

Subcostal vein.—Strictly, the vein below the costa, which in the present work is called the auxiliary vein (after Osten Sacken and many recent authors). Verrall and some others apply the term to the 1st longitudinal vein.

Submarginal cell.—See pp. 8 and 13.

Supra-alar groove.—A groove on the mesothorax just above the base of the wing, short and often indistinct. In bristly species, important bristles are often situated there.

Suture.—A general term for an impressed line. The principal sutures are the *transverse* (p. 5), on the thoracic dorsum, and the *pleural* (p. 5), on the sides of the thorax.

Tanystoma.—Brauer's superfamily name, adopted also by various other authors, for the TABANIDÆ and LEPTIDÆ.

Tarsus.—The third and ultimate of the conspicuous divisions of the legs, always of five distinct though often closely applied joints, of which the first is called the *metatarsus*, the next is the 2nd, and so on, the 5th bearing the feet.

Tawny.—A pale brownish yellow colour varying in intensity, approximately of the colour of a lion.

Tegulæ.—See *Squamæ.*

Tergite.—The plates, or sclerites, on the upper surface of an insect; here more especially applied to the upper half of an abdominal segment, these being numbered in rotation, beginning with that one nearest the thorax.

Tergum.—The upper surface of an insect.

Testaceous.—Technically brick-red, according to handbooks on colour, but my personal opinion is that most authors have used it for what may be better described as "reddish yellow."

Tibiæ.—The second of the large conspicuous divisions of the legs, generally longer and thinner than the femora, and normally longer than the tarsi. In some families and genera one or two spurs or spines at the extreme tip furnish valuable characters in classification.

Tomentum.—A vestiture of exceedingly short, semi-erect hairs, finer and shorter than those known as "pile." Williston says that tomentum can only correctly be used to desiginate "flattened, scale-like or stubble-like, more or less recumbent hairs which gradually merge into dust or pollen."

Transverse.—At right angles to the longitudinal axis of the body, such as the transverse suture on the thorax; or to the length of the wing, such as the "cross-veins." When applied to the head or proboscis it means broader than long.

Transverse suture.—See *Suture.*

Transverse veins—See *Cross-veins.*

Trapezoidal cell.—See *Rhomboidal cell.*

Trochanter.—A small, generally annular joint uniting the coxa to the femur.

Tromoptera.—Osten Sacken's superfamily for the NEMESTRINIDÆ, CYRTIDÆ, BOMBYLIIDÆ, THEREVIDÆ and SCENOPINIDÆ. Verrall confines it to the BOMBYLIIDÆ and THEREVIDÆ.

Truncate.—Ending abruptly, as if cut off.

Ungues.—The claws, two in number, affixed to the lower side of the 5th (terminal) tarsal joint. The remaining portions of the feet consist generally of the pulvilli and the empodium.

Vena spuria.—Only present in the SYRPHIDÆ, a family of the BRACHYCERA. It runs in front of the 4th longitudinal vein and is merely a fold or crease in the wing and not a true vein. It is sometimes indistinct but invariably present in this family except in the genus *Graptomyza.*

Venation.—The system of the veins in the wings. The older dipterologists spoke of it as the *neuration*, a synonymous term used in other orders.

Ventriculum.—The true stomach in Diptera, as distinguished from the diverticulum or sucking stomach.

Vertex.—The upper part of the head, lying between the upper angles of the eyes, merging in front more or less abruptly into the frons (*q. v.*). An imaginary line between it and the back of the head (or occiput) is called the vertical margin.

Vertical margin.—The marginal line between the vertex and the occiput.

Vertical triangle.—The small, often extremely small, space in holoptic flies between the absolute vertex and the spot where the eyes first touch each other. It bears the ocellar triangle (when such is distinct), which in its turn carries the ocelli, when these latter are present,

Verticillate.—When the joints of the antennæ are provided with verticels.

Verticel, or *verticil.*—A whorl of hairs arranged around an antennal joint in the form of a circle. Two or more such whorls may be present on the same joint.

Vestiture.—The outer adornment of the surface of the body, which generally takes the form of short hairs, yet every variety and intermediate grade from strong spines to the finest dust may be found. Large spines, isolated and regularly placed, or numerous and irregularly placed, are spoken of as such. Bristles, the position of which is constant in the genus or species are referred to as chætotactic bristles, and are most valuable adjuncts in classification; they are named according to their situation on the body (see *Chætotaxy*). Irregularly placed bristly hairs (such as are met with in PSYCHODIDÆ) have no technical term. Finer vestiture is known as *hair*, if comparatively long and in any way coarse, shaggy or woolly; if fairly short and fine, it is known as *pubescence*, and this is the commonest form of all. Very short erect closely set hair is known as *pile*; a shorter vestiture still is called *tomentum*; after which the finest form recognised is termed *dust*, or the surface is said to be *pollinose*.

Vinaceous.—The colour of light claret.

Vitta.—A short longitudinal stripe or mark.

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ERRATA AND ADDENDA.

Page

116. *Mycetophila griseolateralis* is a *Delopsis* (p. 118).

120. The genotype of *Sciara* is *S.* (*Tipula*) *thomæ*, L. (Syst. Nat. Ed. xii, p. 976, 1767).

133. Line 20, from top. Relating to this species the text should read "the two examples of this form, in the Indian Museum are distinguished" etc.

133. Line 6, from bottom. This should read "excepting the two females of *longinervis*, none of them" etc.

163. *Plecia fulvicollis*, F. For metamorphoses, see Meijere, Tijd. Ent. liii, pp. 59–63, pl. iv, fig. 12.

164. In the reference to *P. tergorata*, *for* vol. "viii" *read* "vii."

165. *Plecia indica*. For "*type*" read "*types*."

261. To heading, *Dixa ochrilineata*, add (Pl. XII, fig. 8).

262. ,, *D. montana*, ,, (Pl. XII, fig. 9).

263. ,, *D. maculipennis*, ,, (Pl. XII, fig. 10.)

282. ,, *Ptychoptera tibialis*, add (Pl. VI, figs. 1–4).

283. ,, *P. atritarsis*, add (Pl. VI, figs. 5, 6).

288. *Ctenophora*. The genotype is given by Coquillet as *Tipula atrata*, L., but this species is placed in *Xiphura* in the recent Palæaretic Catalogue, so that the oldest species remaining in *Ctenophora* is *pectinicornis*, L., and this may be now regarded as the type species of the restricted genus.

317. *Tipula tessellatipennis*; in heading, *for* "fig. 13" *read* "fig. 12."

372. *Dicranomyia absens*; in heading, *for* "fig. 2" *read* "fig. 4."

387. *Geranomyia*, life-history; for feeding habits, *vide* Knab, Proc. Ent. Soc. Wash. xii, pp. 61–65 (1910).

389. Line 6, from bottom. *Add* "cross-" *before* "veins."

563. Line 14, from top. *For* "fron" *read* "from."

Order DIPTERA.

Apart from the males of the Coccidæ, or scale-insects, the Diptera stand alone amongst the orders of Insects in the peculiarity of possessing only two wings, the hinder wings being represented by a small organ on each side of the thorax behind and below the wing-root, known as the halter. These halteres are invariably present in all the winged forms of the Order, and generally present also in the very few wingless ones. In rare cases the female only is wingless.

The mouth-parts exhibit a wide diversity in structure, but they are nearly always in the shape of a proboscis, formed for sucking, or, in some groups, for piercing the skin of animals or man for the purpose of imbibing the blood.

The antennæ also show extreme range in form, but are valuable as one of the primary means of classification. The palpi have from one to five joints, the usual number in the Nematocera being four; in the Brachycera and the Muscidæ, two, of which the first is small and often more or less rudimentary.

The wings exhibit a multiplicity of schemes of venation, all referable ultimately to a common general plan, and this latter character, the venation, perhaps affords the soundest basis for classifying the families, at any rate, so far as the perfect insects only are concerned.

The larva in the Diptera is apodal, moving by means of small external transverse ridges or stiff bristly hairs, and progressing by a wriggling motion from side to side. In the vast majority of the species, the habitat of the larvæ (popularly known as "grubs" or "maggots") is decomposing vegetable or animal matter, principally the former (the bulk of the higher Muscidæ and a large proportion of the Acalyptrate Muscidæ); a considerable number of species are root- or leaf-miners (Anthomyinæ, Trypetinæ) *; a further considerable number are aquatic (Culicidæ, Chironomidæ, many Tipulidæ, Stratiomyidæ and Acalyptrata, some Tabanidæ, and various genera in many other families); and a few are parasitic on mammals or birds (Œstridæ, Hippoboscidæ),† insects (Conopidæ, etc.), spiders (Cyrtidæ), and other creatures. Some live in the earth (Tabanidæ, Asilidæ, Empidæ), a few are carnivorous (certain Syrphidæ); and one family forms galls (Cecidomyidæ): in short, the larvæ of Diptera as a whole exhibit the most varied methods of existence.

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* Some Indian Trypetinæ live in rotten wood or in fruit.

† Although in Hippoboscidæ the larvæ develop in the body of the parent, the life of the imago is passed upon the body of its host.

The pupa is fixed or free; in the great division of the Orthorrhapha it is mummy-like, that is to say, shewing more or less in outline the parts of the future imago, the shape of the head, antennæ, wings, and legs often being conspicuous; in the second great division, the Cyclorrhapha, it is long egg-shaped, bearing no resemblance to the future insect, and exhibiting no parts whatever of the body in outline.

In the perfect state (imago) Diptera are to be found practically everywhere and in every conceivable situation, a few species occurring even in very high latitudes and desert areas.

A general introduction to the whole order of the Diptera is not contemplated in this volume, and the various parts of the insect are sufficiently well known to the majority of entomologists not to require more than a brief description. The following explanatory paragraphs on the external anatomy of a fly are therefore curtailed as far as expedient. The genus *Tipula* is selected as an example owing to its being the chief genus of the Tipulidæ, the dominant family included in the present work.

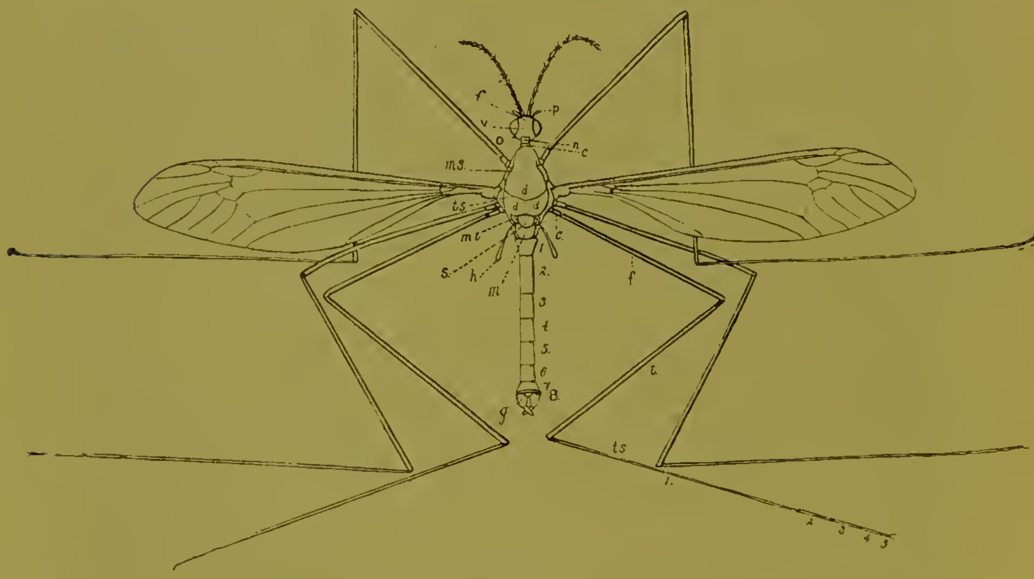

Fig. 1.—Diagram of a *Tipula*, to illustrate the parts of a Dipteron.

Head:—
f. Frons.
v. Vertex.
o. Occiput.
p. Tip of palpus.
n. Neck.

Thorax:—
c. Collare or prothorax.
ms. Mesosternum.
d. Dorsum (or mesonotum).
t.s. Transverse suture.
s. Scutellum.
m. Metanotum.
mt. Metathorax.
h. Halteres.

Legs:—
c. Coxa.
f. Femur.
t. Tibia.
t.s. Tarsus (joints 1–5).

Abdomen:—
1–8. Abdominal segments.
g. Genitalia.

1. External Anatomy of a Fly.

A. *Terminology.**

The Head.

The upper part of the head lying between the eyes is known as the *vertex*, and an imaginary line dividing it from the back of the head, or *occiput*, is called the *vertical margin*. Sometimes a difference of colour clearly defines the limits of these areas, but more frequently such is not the case.

The *frons*, or front, is the whole space between the eyes from the vertical margin to an imaginary transverse line above the base of the antennæ. The vertex is really therefore simply the upper part of the frons, but it is often occupied by a somewhat conspicuous tubercle, or by a more or less triangular impressed space with rounded corners, in which are situated the three small simple eyes known as the *ocelli*, placed in a triangle, the apex of the latter pointing downwards, that is towards the antennæ. These ocelli are in many families absent, in others reduced to two in number, and they may, in a few groups, be placed more or less in a straight line across the upper part of the frons.

Those Diptera in the males of which the eyes touch each other in front for any considerable distance, are termed *holoptic*; those in which the eyes in both sexes are separated by a broad frons, are termed *dichoptic*. Although many cases occur in which it is difficult to decide in which category to enrol them, the vast majority of Diptera can be allotted at first sight to either the *holoptic* or *dichoptic* class.†

In holoptic Diptera, through the eyes not being contiguous absolutely the whole distance from the vertex to the antennæ, there is always a small inverted triangle just above where the eyes meet, its apex pointing downwards, and this is called the *vertical triangle*. At the point where the eyes separate again, a little above the antennæ, is another more or less triangular space with its apex pointing upwards, and this is called the *frontal triangle*. Obviously, in flies with the eyes wide apart, both triangles are merged in the frons and in such cases cannot be differentiated from it.

Cyclorrhaphic Diptera technically possess what is known as the *frontal suture*, and the presence or absence of this suture is

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* This section defines the principal general terms in constant use; the more specialized ones are explained at more suitable places throughout the text, but all are, without exception, to be found in the Glossary.

† The majority of the Brachycera, except Asilidæ and Dolichopidæ, speaking of the larger groups only, are holoptic, as are also the Calyptrate Muscidæ as a rule, and the Rhyphidæ, Bibionidæ, and some Blepharoceridæ in the Nematocera. The remainder of the Nematocera, with the Asilidæ, Dolichopidæ and Acalyptrate Muscidæ, are usually dichoptic, at least in the more extensive groups.

theoretically the only decisive character by which to distinguish members in the imago state, of the CYCLORRHAPHA or ORTHORRHAPHA respectively; but as three of the principal families do *not* possess the suture when they should theoretically do so, the value of the character from a practical point of view is very greatly diminished. This suture, when present (it is never found in the ORTHORRHAPHA), is a more or less oval, or most frequently crescent-shaped, narrow groove, sometimes reduced to an impressed line, and is situated immediately above the base of the antennæ, and the small space it encloses is termed the *frontal lunule.* Through this space is thrust out during the pupal stage, the *ptilinum*, an inflatable organ by means of which the perfect insect springs off the cap of the pupa-case to enable it to emerge. Occasionally this *ptilinum* remains inflated in the perfect insect, as I have seen several specimens of *Syrphus* with it still blown out even in the dried insects.

In many Cyclorrhaphic Diptera, especially among the higher Muscids, there is a well defined band, varying from a very narrow space to one of considerable width, on the inner or frontal side of the eyes, often slightly different in colour from the rest of the frons, not infrequently appearing brilliantly shining white when viewed from above or below. This is known as the *frontal ocular orbit*, or *inner orbit*; other margins of the eyes are spoken of as the facial (below the antennæ) and posterior orbits respectively. These orbits are rarely present in the NEMATOCERA.

Below the antennæ, as far as the mouth, is the *face*, and posterior to the face below the eyes are the *cheeks* or *genæ.*

The *epistome*, or *epistoma*, is a slightly vague term, but strictly speaking it means the mouth-opening, and an indefinite space immediately contiguous thereto. It is probable that a good many authors have used the term to include the whole of the lower part of the head when not dealing with any particular part; in fact, I have used the term myself in this general sense when a very brief description sufficed for the whole of the underside of the head.

Many groups of Diptera possess a system of bristles about the head as well as on the thorax, but since this does not occur in the NEMATOCERA, the subject is not entered upon here.*

The Thorax.

The thorax in the Diptera is seldom divisible into the component parts—prothorax, mesothorax, and metathorax—but forms a uniform oval, oblong, elongate, or sub-quadrate central piece in the front of which the prothorax is sometimes discernible, though in the NEMATOCERA, especially in the TIPULIDÆ, it is often obvious in the form of a circular flattened disc, termed by Osten Sacken the *collare.*

The front part of the thorax when elongated to any appreciable extent is termed the *neck*, but in some families the head is too

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* See Glossary, *Chætotaxy.*

closely applied to the thorax for this to be visible. In the average Dipteron, the head moves with great freedom upon the neck, and is capable of being turned in all directions. The metathorax is hardly distinguishable from the mesothorax, especially on the upper side.

On the shoulders, that is, the anterior corners of the thorax, a slight swelling is often present, known as the *humerus*, or *humeral callus* or callosity. These humeral calli are frequently absent, and when present are very often differently coloured from the rest of the thorax. Other calli situated on various parts of the thorax bear significant names. The *pre-alar callus* is a small swelling in front of the wing-root, towards the side of the thoracic dorsum, which latter is generally spoken of as the *mesonotum*. The *post-alar calli* lie behind the wing; when they are on the hinder corners of the dorsum they are termed *posterior calli*. Sometimes I have used the term *post-sutural calli* in place of *post-alar calli*.

Across the centre of the mesonotum in many Diptera is seen a more or less distinctly impressed line, often somewhat like a very widely opened V, faintest in the middle, and ending on each side a little in front of the base of the wings. This is the *transverse suture*, and it has a high morphological value, being very consistent when present. In the NEMATOCERA it is a strong character of the TIPULIDÆ (with one or two comparatively unimportant exceptions). Behind this suture (speaking now principally of TIPULIDÆ) and between the slight swellings of the post-alar calli is a slight depression, which in the present work is referred to as the *post-sutural depression*.

The *presutural depression* is a small depression at each end of the transverse suture, usually triangular in shape.

The *supra-alar groove* is a groove on the mesothorax just above the wing-root, and in many species bristles of taxonomic importance are found along its inner margin.

The *scutellum* is a projecting posterior lobe of the mesonotum, and a horny irregular ridge-like projection joining the scutellum on each side to the mesonotum is termed the *scutellar ridge*. It is sometimes, but not usually, conspicuous.

Behind and below the scutellum is the *metanotum*, a smooth and more or less swollen part, attaining its maximum development in the TIPULIDÆ, in which it is usually much more conspicuous than the scutellum.

The *halteres*, which in Diptera replace the posterior wings, are small delicate organs consisting of a narrow moderately long stem, ending in an oval club, which occasionally is flattened or spatulate.

The sides of the thorax in many Diptera are distinctly subdivided by impressed lines known as *pleural sutures*, whilst in others such demarcations are not perceptible; when present they divide the sides into pleural spaces, which in some groups are well defined, whilst in others they are very indefinite. Most authors speak of them in general terms as "the pleuræ." These

pleural divisions do not afford so many taxonomic characters in the NEMATOCERA as in some other groups, being always devoid of bristles, and it is these latter which are strongly indicative of affinities.

Fig. 2.—Pleural divisions of the thorax of a fly.

a. Prothorax or propleura.
b. Mesopleura.
c. Metapleura.
d. Sternopleura.
e. Pteropleura.
f. Hypopleura.
g. Plumula.
ps. Pleural or thoracic stigma.

The three prinicipal sutures recoguised generally are, (1) the *dorsopleural suture* (or *notopleural*) running from the shoulder to the base of the wings and dividing the dorsum (or mesonotum) from the pleuræ as a whole; (2) the *sternopleural suture*, roughly speaking, parallel with the dorsopleural, placed about the middle of the body or a little below it, and dividing the mesopleura from the sternopleura; and (3) the *mesopleural suture*, a more or less vertical irregular line from the base of the wings downwards, dividing the mesopleura from the pteropleura.

The pleuræ themselves are distributed as follows:—The *propleura*, or *prothorax* (generally termed the latter in the present work), is on the immediate anterior part of the thorax. The *mesopleura* lies behind it, in front of the wings, bounded above by the dorsopleural suture and below by the sternopleural suture. The *metapleura* lies immediately behind the wings, above and rather behind the *pteropleura*, which lies directly below the wings, extendiug downwards to between the two hinder pairs of legs. The *hypopleura* is a small piece below the metapleura and immediately over the hind coxæ. The *sternopleura* is usually the largest of all and lies below the sternopleural suture and exteuds downwards, occupying all the space between the front and middle legs. The mesopleural suture therefore has the mesopleura and sternopleura in front of it and the pteropleura behind it. A small piece behind the metapleura is kuown as the *plumula*; and a small orifice on the prothorax just below the dorsum is the thoracic stigma.

Since the NEMATOCERA are wholly eremochætous, that is to say,

devoid of strong bristles on the body (the MYCETOPHILIDÆ possess conspicuous and characteristic bristles on the *legs*), it seems unnecessary to dilate here on the scheme of chætotaxy, or the systematic study of these appendages ; but a brief outline of the system is given in the Glossary under *Chætotaxy*.

The Abdomen.

Few special terms are in use regarding the abdomen except that the external male genital organs are spoken of collectively as the *hypopygium*,* whilst the female organs are known as the *ovipositor*. The eight segments of the abdomen are numbered from the base onwards, the usual terms used in the TIPULIDÆ, where the covering of this part of the body is represented by a distinct dorsal and ventral plate, being *tergum* and *sternum* respectively.†

The Legs.

These also call for but little description, most of the terms being in common use. The *acetabulum* is a minute joint attaching the coxa to the body; the *coxa* is the short first obvious joint which is united to the *femur*, the first long conspicuous part of the legs, by another minute, ring-like piece, known as the *trochanter*. The *tibia* succeeds the femur and is the second conspicuous division, followed by the *tarsus*, or foot, which is invariably composed of five joints.‡ These joints are numbered from the basal one, which is known either as the *metatarsus*, or the first tarsal joint. Care must be taken to note that the next joint following the metatarsus is the *second*.

Attached to the extremity of the ultimate tarsal joint are the *ungues*, or claws, two curved hooks, and below these are two pad-like cushions or *pulvilli*.§ These are often absent in the ORTHORRHAPHA. Between the claws, and below them, attached, like the pulvilli, to the last tarsal joint, is the *empodium*, which sometimes takes the shape of another pad, in which case it is said to be pulvilliform, and sometimes that of a thick bristle or spine. Osten Sacken placed much reliance on it as a classificatory character in TIPULIDÆ, but I am inclined to doubt its value to such an

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* Bergroth has proposed *propygium*, but hypopygium is universally adopted by dipterologists, whenever a special term is used.

† Westhoff terms the upper and lower sides of the 8th segment the *lamella basalis supera* and *infera*, respectively, and those of the 9th segment or the one actually developed into the genital organs, the *lamella terminalis supera* and *infera*, respectively, but I know of no one who has adopted these unwieldy names.

‡ The exceptions are very few and only amongst abnormal forms.

§ Too much importance should not be given to minor differences, such as the comparative size, toothed nature, and so on, of the ungues, presence or absence of empodia, etc. When Theobald's first volume on the CULICIDÆ of the world was published, great stress was laid on very microscopic differences in the shape and size of the different pairs of claws, and in my Catalogue of Oriental CULICIDÆ the great importance of these characters was questioned. In subsequent volumes of Theobald's work it was admitted that they did not possess the value at first accorded to them.

extent. Often it is absent, and occasionally it is present when the pulvilli themselves are wanting.

The *anterior* legs are the four front legs taken together, the *posterior* legs the four hind legs similarly considered. When spoken of singly they are called the fore (front or first) pair; middle (median or second) pair; and the hind (or third) pair.

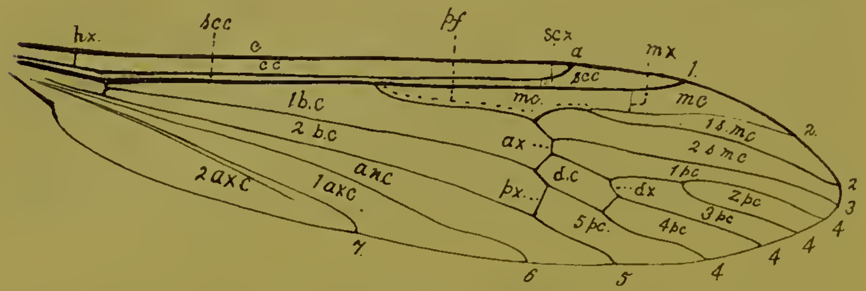

Fig. 3.—Wing of *Limnophila*.

c, costal vein.	*cc*, costal cell.
a, auxiliary vein.	*sc.c*, subcostal cell.
1, 1st longitudinal vein.	*mc*, marginal cell (inner and outer).
2, 2nd do.	1 *sm.c*, 1st submarginal cell.
3, 3rd do.	2 *sm.c*, 2nd submarginal cell.
4, 4th do.	1 *pc*, 1st posterior cell.
5, 5th do.	2 *pc*, 2nd do.
6, 6th do.	3 *pc*, 3rd do.
7, 7th do.	4 *pc*, 4th do.
hx, humeral cross-vein.	5 *pc*, 5th do.
sc.x, subcostal cross-vein.	*an.c*, anal cell.
mx, marginal cross-vein.	1 *ax.c*, 1st axillary cell.
ax, anterior cross-vein.	2 *ax.c*, 2nd do.
px, posterior cross-vein.	*dc*, discal cell.
pf, præfurca.	1 *bc*, 1st basal cell.
	2 *bc*, 2nd do.

The Wings.

The Veins.—As a typical wing from which to illustrate the venation,* having special reference to the Nematocera, that of *Limnophila* has been chosen.†

The front margin of the wing is known as the *costa*, and is

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* The term neuration was employed by many of the older authors instead of venation, but the latter is at present in almost universal use.

† It must be understood that a diagrammatic wing to expound the whole theory of venation throughout the Diptera is an impossibility, and the wing of *Limnophila* is selected because it possesses the greatest number of cells and veins in the Nematocera. The relative lengths and positions of these are given in the main as for *Limnophila*, but it must be understood that these proportions vary in different groups and to a still greater extent in different families. The student should be able, after mastering the terminology of one family, to identify the corresponding veins in others, and to recognise which are present and which are absent or modified.

carried right round the wing uninterruptedly, without any distinct or sudden termination near or just beyond the tip, as in some families of NEMATOCERA.

The *auxiliary vein* is the first vein below the costa, and generally ends, in the TIPULIDÆ, between the middle (or just before the middle) and about three-fourths the length of the wing. It is connected with the costa quite near its base by a short upright cross-vein, the latter known as the *humeral cross-vein.* The auxiliary vein is often known as the *subcostal,* which is perhaps a better name, but since in studying TIPULIDÆ the works of Osten Sacken *must* be consulted, his name for this vein is adopted in preference.

The next vein is a much longer one, running parallel with the auxiliary vein and ending some little distance beyond it; this is the 1*st longitudinal vein.* It either turns up rather suddenly at the tip into the costa, as is generally the case in the LIMNOBIINÆ, or turns distinctly down at the tip into the 2nd longitudinal vein, as is usually the case in the TIPULINÆ. In some few cases it fades away at the tip without turning either up or down. The auxiliary vein often lies so closely in front of the 1st longitudinal vein as to be imperceptible unless carefully looked for. In some few genera these two veins are actually united (*Toxorhina*, *Styringomyia*), and in these cases the 1st longitudinal vein, as the united veins are invariably called, generally approximates gradually to the costa, finally becoming merged in it, and not turning distinctly up or down at the tip as in the typical forms. The auxiliary vein and the 1st longitudinal are, in the TIPULIDÆ, nearly always connected by a short cross-vein known as the *subcostal cross-vein,* which is most frequently situated towards the end of the auxiliary vein, but sometimes occurs a little before or after the origin of the 2nd longitudinal vein. Considerable importance attaches not only to the actual length of the auxiliary vein, but to the relative position of the subcostal cross-vein, although exceptions occur, even in otherwise closely allied genera (in the ERIOPTERINI, for instance).

The 2*nd longitudinal vein* emerges from the first, usually somewhere near the middle of the latter, sometimes in a straight line at a more or less acute angle, but more often in a gentle or distinct curve. When the 2nd longitudinal vein is "simple" (that is to say, not forked) there is only one submarginal cell ;* when the 2nd vein is forked there are two, and this character is of paramount importance, being the very first one employed in separating the subfamilies ; and on it depends the terminology of many of the cells.† The portion or section of the 2nd

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* *Vide* p. 13 for description of cells.

† The principal exception in Oriental genera is *Gonomyia*, in which some species have but one whilst others have two submarginal cells. This instability is very exceptional as a generic character (*Gonomyia*).

longitudinal vein * between its origin and the point of forking is called the *præfurca*; the two branches, after forking, are the "anterior and posterior," the "upper and lower," or the "fore (or front) and hind," respectively.†

It may be noted here that Mr. Verrall uses the term *præfurca* for the "common origin" of the 2nd and 3rd longitudinal veins, that is to say it terminates at the origin of the 3rd vein, but it is adopted in the present work in Osten Sacken's sense, comprising the whole of the 2nd vein as far as the fork. The section of the præfurca between the origin of the 3rd vein and the fork of the 2nd is often referred to as the *petiole of the 1st submarginal cell*. Naturally this only applies when the 2nd vein is forked, as otherwise there is only one submarginal cell.

The *marginal cross-vein* is placed near the tip of the 1st longitudinal vein, joining it to the 2nd vein and dividing the marginal cell into two parts, often into about equal halves, these being known as the *inner* and *outer marginal cell* respectively. When the 2nd vein is forked this cross-vein may unite with the upper branch or with the præfurca, and it has a tendency to indistinctness in many species. It is present in the large majority of genera in TIPULIDÆ, but is absent in some (*Atarba*, *Toxorhina*, *Rhamphidia*, etc.); it is indistinct in *Limnophila*, present in *Ptychoptera* and the TIPULINÆ, whilst in the CYLINDROTOMINI it is replaced by a small and often indistinct cross-vein between the 1st longitudinal vein and the costa. The value of its presence or absence has been over-estimated by one or two authors, although it can usually be accepted as a good character.

The *3rd longitudinal vein* emerges from the præfurca in nearly all the TIPULIDÆ,‡ and the præfurca itself is often bent downwards at a more or less distinct angle at the point of contact. The 3rd vein is simple in all the Oriental genera, except in the subfamily PTYCHOPTERINÆ, in which its forked nature constitutes one of the principal characteristics of the group. It is nearly always present, any genus without it being most abnormal. In *Toxorhina* it is altogether absent, the anterior cross-vein connecting the 2nd and 4th longitudinal veins; in *Mongoma* (according to my interpretation of the venation) it is reduced to a short longitudinal connecting vein between the middle of the præfurca and the 4th longitudinal, thus not even approaching the margin of

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* It will be understood that the abbreviation "1st vein," "2nd vein," "3rd longitudinal," and so on, in all instances means the 1st longitudinal vein, 2nd longitudinal vein, 3rd longitudinal vein, etc.

† When once the principle is thoroughly understood that it is the *second* longitudinal vein which forks in TIPULIDÆ (and hardly ever the *third*), it is not of great consequence what may be the exact terms used; nor is there any unanimity in the matter. In company with other authors I use all the terms quoted indiscriminately.

‡ The principal exception is *Amalopis*, in which it emerges either from the posterior branch of the 2nd vein or from the præfurca, according to the species.

the wing.* In *Ptychoptera*, the principal genus of the subfamily PTYCHOPTERINÆ, the 3rd vein issues from the præfurca at a point where that vein makes such a sharp angle that the general appearance is that of two long veins crossing one another nearly at right angles,† the first being composed of the basal section of the 2nd vein and the 3rd vein; the 2nd vein being composed of the anterior cross-vein and the remaining section of the præfurca.

The next vein is probably the most important of all in the wing: this is a short cross-vein which almost invariably throughout the Order connects the 3rd and 4th veins when both are present; and this vein, the *anterior cross-vein*,‡ is, in conjunction with the discal cell, technically, a key to the venation in the whole order of Diptera.§ It divides the wing longitudinally into two nearly equal halves, and no vein found in front of it in one group is ever found behind it in another. When the discal cell is present the anterior cross-vein is placed immediately above it (in TIPULIDÆ), usually, at or near the base of the cell, rarely beyond it (*Conosia*). When the discal cell is absent this cross-vein unites the 3rd longitudinal vein to that part of the 4th vein which would have formed the anterior side of the cell, had it been present. In the NEMATOCERA it can nearly always be employed as a central vein around which to recognise the adjacent veins; and a little practice and comparative study of the wings of other families will enable the student to determine it with tolerable accuracy.

It is usually more or less upright, generally short, sometimes very short, more rarely moderately long; being wholly absent in only a very limited number of quite abnormal genera of TIPULIDÆ.||

Having recognised the anterior cross-vein, joining the 3rd and 4th longitudinal veins, it is easy to find the 2nd longitudinal vein and to ascertain, according as that vein be simple or forked, whether there are one or two submarginal cells. The cell on the inner side of the anterior cross-vein is the 1*st basal cell*, the cell on its outer side is the 1*st posterior cell*. This rule is practically inviolate, not only in the TIPULIDÆ, but in all families of Diptera with a tolerably complete venation.

The 4*th longitudinal vein* begins at the base of the wing, and invariably encloses, or rather constructs, the discal cell (when

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* This is the only instance I know of showing this abnormality, and it is just possible that the vein might be more correctly regarded as the anterior cross-vein. This, however, is doubtful—*vide* discussion under *Mongoma*.

† Note *Ptychoptera* in the comparative figures of wings.

‡ Also known as the "small cross-vein," and the "internal transverse vein."

§ This must not be taken too literally, as exceptions embracing whole families occur, such as the CECIDOMYIDÆ, SIMULIIDÆ, and outside of the NEMATOCERA, the PHORIDÆ, etc., but all these exceptions are instances of incomplete or aberrant venation.

|| The only such Oriental genus is *Mongoma*.

this is present) by being, in these cases, always forked, the absence of the discal cell being only caused through the absence of a short cross-vein between the two main branches of the 4th vein, and this cross-vein is usually called the *discal cross-vein*, on account of its dominating the discal cell. It will be seen that the 4th longitudinal vein forks *at* the discal cell,* its upper or anterior branch forming the basal and anterior sides of this cell; the lower or posterior branch forming the posterior and outer sides of the cell. Apparently, the outer or distal side of the discal cell is formed in most genera of TIPULIDÆ by two short veins, both nearly straight themselves, yet not often in a straight line with one another. The upper one of these short veins is my discal cross-vein, the lower one is considered part of the lower branch of the 4th vein, the straight continuation of the basal part of the 4th vein being regarded as a branch vein known as Loew's *posterior intercalary vein*. The upper branch of the 4th vein, after quitting the discal cell, forks again, the upper prong being considered as the continuation of the vein itself, the lower prong the branch vein, and this latter is known as Loew's *anterior intercalary vein*.† When the anterior or upper branch of the 4th vein is forked, the section between the discal cell and the fork is known as the *petiole of the 2nd posterior cell*. In the same manner, in a case where there is no discal cell and the posterior branch of the 4th vein is forked, it would be correct to speak of the corresponding section of that branch as the "petiole" of that posterior cell which was contained by the fork.

Somewhere beyond the middle of the 4th longitudinal vein is a longer cross-vein, generally more or less obliquely placed. This is the *posterior* cross-vein, which in TIPULIDÆ invariably connects the 4th and 5th veins, and is practically always straight itself,

* Slightly but distinctly before it in *Megistocera*, the only exception known to me.

† It seems to me that although the lower prong of the upper branch of the 4th vein is really the additional veinlet due to the forking, a mistake has been made by even Loew, one of the soundest of dipterologists, in regarding the upper prong of the lower branch of the 4th vein as the true continuation of that branch, since, when this lower branch is not forked it *never* takes the course containing two sharp angles but continues in a more or less straight line to the wing-margin. This compels me to believe that the *lower prong is the true continuation of the lower branch* of the 4th vein, and that the upper prong is the additional veinlet due to the forking and that this upper prong should have been named the posterior intercalary vein by Loew. I have not seen this view suggested anywhere, but unless it be admitted, the anomaly would be presented of the lower branch, when forked, taking two abrupt angles, but when simple, proceeding in a straight line to the wing-margin, a curious and quite illogical theory. This view applies to the LIMNOBIINÆ only, as in the TIPULINÆ, in which the lower branch is always forked, the lower prong appeals irresistibly to me as the additional veinlet, and the upper one (forming part of the discal cell and being much less angulated) as the true continuation of the lower branch. There seems nothing illogical in the assumption that an additional veinlet may occur on either side of a parent vein as a subfamily character.

though placed at various angles to the two veins it connects. Occasionally (in *Mongoma*, for instance) the 5th vein bends down at the tip, meeting the 6th vein and thus closing the anal cell, instead of running to the margin of the wing as in most genera. The *5th longitudinal vein*, with the 4th, the 6th, and 7th all spring from the base of the wing. The *6th longitudinal vein* lies posterior to the 5th and is normally straight or only gently curved;* the *7th longitudinal*, being the last vein, usually parallel, or approximately so, to the length of the wing.

In TIPULIDÆ, the 5th, 6th, and 7th veins are never forked. The 7th vein varies in length and direction; in the PTYCHOPTERINÆ it is comparatively short, taking a distinct downward curve at the tip to meet the wing-margin. In *Trichocera* the same thing occurs, only the vein is much shorter still, so short as to be easily overlooked altogether. In other genera, *Mongoma* for instance, the 7th vein, though much shortened, is only gently curved.

The term *central cross-veins* was sometimes used by Osten Sacken to designate the veins between the end of the præfurca (transversely across the wing's length) and the posterior cross-vein; in this case the short basal section of the 3rd vein, the basal part of the fork of the 4th and both sides of the discal cell would be included in addition to the two cross-veins proper.†

Not infrequently a genus or species is distinguished by the presence of an extra vein which is constant in its occurrence. Such veins are called *supernumerary*. When they occur abnormally in individual specimens (often in one wing only) they are called *adventitious*, and such occurrences are quite frequent, especially in the ERIOPTERINI, in which their unexpected presence causes much difficulty to the beginner.

The Cells.—The recognition of the cells, once the terminology of the veins is mastered, is comparatively easy.

The first, immediately below the costa, and bounded posteriorly by the auxiliary vein, is the *costal cell*; that between the auxiliary vein and the 1st longitudinal vein (often difficult to perceive on account of these two veins lying so close to one another) is the *subcostal cell*. In cases where the auxiliary vein and the 1st longitudinal vein are united (*Toxorhina*, *Styringomyia*) the subcostal cell is of course absent.

The 2nd longitudinal vein always has in front of it the *marginal cell*. When the 2nd vein is simple the cell immediately behind it is the *submarginal*, but when the 2nd vein is forked there are two such cells, in which case they are called the *1st* and *2nd*

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* Absent altogether in PTYCHOPTERINÆ.

† This is rather a vague definition, but so many species have clear wings except for slight infuscations on all the veins or portions of veins that lie transverse to the wing's length, that most authors have adopted it for descriptions of certain species at some time or other, myself included. The term should in any case be used with caution.

submarginal cells respectively.* Care must be taken in those genera (*Gonomyia*, *Mongoma*, etc.) in which the fork of the 2nd longitudinal vein is short and nearly perpendicular, giving it the appearance of a cross-vein, for which it might easily be mistaken.

When the marginal cell is divided by the marginal cross-vein, as is the case with most genera of TIPULIDÆ, the divisions of the cell are known as the inner and outer marginal cells respectively, but when speaking of the united cells the term " marginal cell " is correct.

It will thus be seen that the 3rd vein has in front of it the submarginal cell, if the 2nd longitudinal vein be simple, and the 2nd submarginal cell, if the 2nd vein be forked.

Immediately below the 3rd vein is the *anterior cross-vein*, the key to the whole venation. This vein always joins the 3rd and 4th longitudinal veins, exceptions being very rare (*Amalopis*), and it always meets the 4th vein at the discal cell (usually at the anterior upper corner of the latter), when this cell is present.† However, whether the discal cell be present or not, the anterior cross-vein meets the 4th vein exactly or very nearly at the same place. Thus the discal cell in the vast majority of TIPULIDÆ has the 1*st posterior cell* in front of it, and (except in TIPULINÆ) the *ultimate* posterior cell (4th or 5th, etc., as may be) behind it.‡

The anterior cross-vein always bounds on its inner side the 1*st basal cell*, below (or posterior to) which latter is the 2*nd basal cell*, of varying relative length but always conspicuously longer in TIPULIDÆ than in most families of Diptera.

Behind, or posterior to, the 1st posterior cell the other posterior cells run on in numerical order, four being the usual number in this family, less frequently five (*Limnophila*, *Cladura*, some *Eriocera*); occasionally only three (*Bittacomorpha*, a non-Oriental genus), *the last posterior cell being that one of which the posterior cross-vein forms the base.*

Posterior to the 5th longitudinal vein is the *anal cell*, open in

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* In the case of *Ptychoptera*, where the unusual event of the 3rd longitudinal vein forking instead of the 2nd is found, the same rule as to the nomenclature of the cells holds good; thus the 1st submarginal cell is bounded by the 2nd vein and the upper branch of the 3rd vein, whilst the 2nd submarginal cell is bounded by both the branches of the 3rd vein. One or two authors have contended that it would be more correct, when the 2nd vein is forked and the 3rd vein simple, to regard the cells as two marginal and one submarginal; and when the 2nd vein is simple and the 3rd forked, as one marginal and two submarginal; that is to say, all cells bounded posteriorly by the 2nd vein would be called marginal cells, and those bounded posteriorly by the 3rd vein, submarginal cells, in each case irrespective of their number. In the conceivable case of both 2nd and 3rd veins being forked, there would be two marginal and two submarginal cells.

† The only exception in TIPULIDÆ amongst Oriental genera is *Conosia*, Wied., in which the anterior cross-vein is placed very distinctly beyond the discal cell.

‡ Of course, when the posterior cross-vein is placed so far distally as to be *beyond* the limits of the discal cell, the latter is bounded posteriorly by the 2nd basal cell. It invariably has the 1st basal cell on its inner side. In the TIPULINÆ the *penultimate*, not the ultimate, posterior cell bounds the discal cell posteriorly, on account of the lower branch of the 4th longitudinal vein forking just at the lower basal corner of the discal cell.

the great majority of genera in TIPULIDÆ, but occasionally closed (*Mongoma*) by the turning down of the 5th vein at its tip, meeting the 6th vein before the border of the wing. When open, therefore, it runs the whole length of the wing from the base to the wing-margin. Posterior to the 6th vein is the *axillary cell.* In TIPULIDÆ, in which the 7th vein is nearly always complete, that is to say, attains the margin of the wing, there is of course yet another cell—the last—in the hind angle of the wing. In those families of Diptera which have the 7th vein incomplete, all the space between the 6th vein and the hinder angle of the wing is considered the axillary cell (called by some of the older authors the "spurious" cell, presumably on account of its ill-defined nature). Some authors speak of a 1st and 2nd anal cell, plus an axillary cell. Where there has been occasion to mention this ultimate cell specially as such, it is herein called the *2nd axillary cell*, thus retaining only one anal cell in the wing.*

Wing pubescence.—A note may be made here regarding the terms "wings bare" or wings pubescent" in this family. It is probable that under very high microscopic power every wing will be seen to possess extremely minute stiff hairs, but when such are wholly invisible to the naked eye or to an ordinary entomological hand-lens, the wing is considered bare, or, as some authors have termed it, glabrous; and generally it is more or less iridescent. These microscopic setæ are therefore never regarded as pubescence. When the naked eye or a hand-lens reveals distinct hairs on the veins or on the surface of the wing itself, the wing is considered pubescent. Practically all the veins bear microscopic short stiff hairs, but if these are not clearly seen without a microscope, the veins are not termed pubescent or bristly.

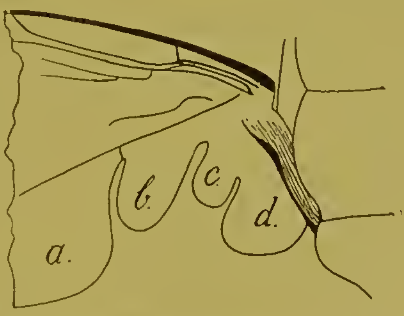

Fig. 4.—The basal portion of a fly's wing.
a, axillary lobe; *b*, alula; *c*, antitegula; *d*, tegula.

The alulæ, tegulæ (or squamæ), and halteres.—The basal corner of the hind margin of the wing is often well developed, at times forming quite a projecting angle, and this part is known as the

* In the case of *Ptychoptera*, the 6th longitudinal vein being absent, there are only two cells altogether between the 5th vein and the hind angle of the wing, namely the anal and axillary cells.

axillary lobe. Behind this is an indentation of the wing-margin called the *axillary incision*, and beyond this again (working towards the base of the wing), is a small, more or less well developed continuation of the wing—the *alula*. In some wings, such as those of cuneiform shape, the axillary lobe is, perforce, absent, and the alula is reduced to a minimum. Behind the alula are two more or less rounded, scale-like organs, generally of a dirty white colour, and frequently with a fringe of hairs on the edges; these are the *squamæ*, and they have given rise to considerable dispute as to their correct names. When the wings are folded, the upper one, which is nearly always the smaller of the two, partly covers the lower one, and when the wings are outstretched the upper one moves forward, being actually the extreme base of the wing, and the lower one, then fully disclosed, is seen to be definitely fixed to the thorax.

The term *tegulæ* appears to date from Loew, in 1844,* when he distinctly differentiated it from the alula (the final basal lobe of the wing), and it is applied to the squama which is fixed to the thorax. Osten Sacken invented *antitegula* for the anterior scale, to which at times it was necessary to refer specially, and he gives a clear resumé of the various terms used for these parts in a short paper.† He also suggests as alternative names to *antitegula* and *tegula*, *antisquama* and *squama*, when speaking of each separately, or simply *squamæ* (in the plural), if both pairs together be referred to. In the present work the two pairs, anterior and posterior, taken together are sometimes described as the *squamæ* and sometimes as the *tegulæ*.‡ Since, in the NEMATOCERA the thoracic squama is very rudimentary, there have been few occasions to refer specially to either the anterior or posterior pair.

Confusion has frequently arisen owing to many authors calling these structures the *alulæ*; and a recent writer, Comstock, still adheres to this view, contending that the term tegula should not be employed, having been preoccupied for the cup-like scale above the root of the wings in some Hymenoptera. A great number of terms have been applied to both the alulæ and the squamæ, especially the latter, but no advantage would ensue by discussing them here.§ Verrall uses the names *alar* and *thoracic squamæ*, and perhaps these are the most suitable of all.

As for the *halteres* or aborted hind wings, they are in some way connected with the power of flight, since if they are removed, a Dipteron flies erratically. They are short cylindrical stems, bearing an oval or flattened knob or club at the tip, and are placed behind and a little below the roots of the wings. The insect can vibrate them with great rapidity in the same manner as a wing.

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* Stettin Ent. Zeit. 1844, p. 326, footnote.

† Berlin. Ent. Zeit. xli, 1896, p. 285.

‡ I am not at all certain that in my earlier writings I have not used the term *alulæ* to designate the *tegulæ*.

§ Amongst the terms used for the squamæ are calyptræ, alulets, winglets, auricles, ailerons, cuillerons.

B. *Descriptive*.*

The Head.

The eyes.—With the exception of some of the EPROBOSCIDEA (PUPIPARA), the large compound eyes so strikingly prominent in most species of Diptera, are invariably present. In the majority of the NEMATOCERA the eyes are separated by a frons, or front, of equal width in the two sexes, but in most of the families of the BRACHYCERA (except the ASILIDÆ and DOLICHOPIDÆ), and in the great majority of the higher Calyptrate MUSCIDÆ the eyes in the male touch each other in front for a considerable distance. Exceptions occur in some BLEPHAROCERIDÆ, in which the head is holoptic in one or both sexes, or dichoptic in both; also in the CYRTIDÆ, in which the eyes are contiguous in both sexes both above and below. As a rule the eyes are always well separated on the underside of the head, but in many TIPULIDÆ they are there contiguous or subcontiguous. In most families they are oval or semicircular; in some, enormously enlarged, occupying practically all the head (CYRTIDÆ, PIPUNCULIDÆ); in others, kidney-shaped (PSYCHODIDÆ and many groups of MYCETOPHILIDÆ). They may be thickly or lightly pubescent, or bare, these features being often not contingent on sex. In a few families they possess coloured bands in life (TABANIDÆ, some ASILIDÆ), which fade after death, but which may generally be caused to reappear by an application of damp sand. In the genus *Bibio* the male eye is curiously divided into two parts, and in most BLEPHAROCERIDÆ the eye, at least in the male, is sharply divided into an upper and lower part, the facets in one being very large, and in the other much smaller, and the two parts being separated by a narrow unfacetted band. In one small family of Acalyptrate MUSCIDÆ, the DIOPSINÆ, the head is produced on each side into long eye-stalks, at the tips of which are placed the eyes. In some wingless PHORIDÆ the eyes are somewhat aborted.

The ocelli or simple eyes have been sufficiently described under the heading "Terminology."

The mouth-parts.—"No point of insect morphology has given rise to more differences of opinion than the mouth of Diptera." (Dr. Sharp, 1899.) This being supported by the existence of so many views as to the homologies of the dipterous mouth-parts, the present references may be judiciously curtailed.

Of the various authors perused, I venture to select Williston's definition of these parts as being the most concise and recent (1908). This author is therefore quoted verbatim:—

"The more commonly accepted homologies of the mouth-parts are as follows: labium, maxillæ, maxillary palpi, mandibles,

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* The notes comprised under this heading are of the briefest, since a general introduction to the order of Diptera is not attempted in this volume, and the characters of the families treated of herein are fully detailed in their respective places.

hypopharynx, and labrum or labrum-epipharynx. The labial palpi are thought to be wholly wanting or represented by the labella.* The labium is always present, more or less fleshy and provided with muscles. It is grooved or channeled on the upper side to receive the other parts, with the exception of the maxillary palpi, which are free. This sheath is often nearly complete, the thin margins touching each other above. At its tip are the pair of joints of variable size called the lips or labella. The maxillæ and mandibles are sometimes absent, the mandibles most frequently; when present they are always slender and firm. The hypopharynx is unpaired and slender, grooved on the upperside and sometimes converted into a nearly complete tube. The labrum, also unpaired, is usually elongate and grooved on the underside, forming by apposition with the hypopharynx a complete tube. The mandibles are frequently absent; in fact, I do not know of their occurrence in any flies with a simple third antennal joint, and they may be absent in the male when present in the female, as in the TABANIDÆ. They are always piercing-organs, thin, firm, chitinous, and usually slender. The two maxillæ, likewise piercing-organs, find their highest development in such predaceous flies as the ASILIDÆ. Like the mandibles they are chitinous and slender. In some they are more or less flattened, and may have curiously shaped projections at the tip; usually they are bristle-like. They lie with the maxillæ within the sheath of the labium, at either side of the labrum and hypopharynx. In some cases the labrum is short, and serves only as a cover for the proximal part of the hypopharynx, but usually it is as long as, or longer than, the hypopharynx, and has a simple groove on the underside. The hypopharynx is always present in flies in which the mouth-parts are functional. It is, more often, a slender firm organ, grooved upon the upperside, which by apposition with the labrum forms a distinct tube. In some, however, it may form an almost complete tube in itself."

The mouth in the CULICIDÆ may be described as consisting of eight pieces of approximately equal length, the labium being slightly longer than the others.† The labrum, or upper lip, is uppermost, and closely united to it on the underside is an equally long but very slender piece known as the epipharynx.‡ Two slender lancet-like pieces come next: these are the mandibles, and below these, two "delicate needle-like organs, barbed at the summit, the maxillæ." There is also a "thin tubular thread," the so-called hypopharynx, this being connected with a poison gland at its base. Below these is the stoutest piece of all, the labium or lower lip, grooved on its upperside to admit of the reception of all

* This has been recently contested by Wesché.

† This description is after Theobald (Monog. Culic. i, p. 3).

‡ Theobald recommends abolishing this term, as this piece is really part of the labrum, but there are occasions when, exact reference to it being required, a special term is necessary.

the other pieces except the labrum, which covers them like a sheath from above. At the tip of the labium are two small oval lamellæ in the form of two spatulate jointed valves, and these represent the labial palpi.

"During the act of piercing the skin, all the mouth-parts but the lower lip (labium) are inserted; the labium bends and guides the other mouth-parts into the skin. The blood is drawn up the upper lip, the tube being formed by the upper lip, and closed below by the hypopharynx."

Meinert wrote, in 1881, a copious anatomical essay on the mouth-parts of the Diptera, presumably in Danish,* but his views on many points are very original and not corroborated by the examinations of other writers. He employs also a terminology entirely his own.

The palpi.—For purposes of classification the most important organs appertaining to the mouth † are the maxillary palpi, usually spoken of simply as the palpi, as the labial palpi are considered to be represented by the labella; some authors do not agree with this view and think that the labial palpi are entirely absent in this order. Wesché, in fact, has in recent times contested that either maxillary or labial palpi may be present and functional, but no cases are known of both pairs being functionally present.

The palpi in the vast majority of Diptera are either long and composed of four joints, as is the case with the great bulk of the NEMATOCERA, or quite short and composed of two joints, the first being very small, as is the case in the bulk of the remaining families. Occasionally a 5th joint is evidently present, though its existence has been generally denied till quite recently; in these cases the conical protuberance of the proboscis, upon which the palpi are in many instances inserted, is sufficiently differentiated to form a distinct basal joint, but such instances are not common. In two or three Oriental species of *Phlebotomus* this basal joint is present. It seems hardly necessary to note that the joints are counted from the base outwards, so that in a 2-, 4-, or 5-jointed palpus the last or terminal joint is the 2nd, 4th, or 5th respectively. In size, shape, and relative length of the joints they exhibit great diversity, a considerable amount of variation being found in the same genus, frequently a single joint being enormously enlarged, or peculiarly formed.

Generally situated at or very near the base of the proboscis, the palpi are in rare instances placed at its middle (*Geranomyia*), or tip (*Elephantomyia*); in these cases the proboscis is very conspicuously elongated. Williston says "the tendency in Diptera

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* I have not seen the work. It is called 'Fluernes munddele,' 91 pp., 6 pl. Stockholm, 1881.

† In the description of the mouth-parts I am much indebted to Prof. Williston's admirable manual on North American Diptera (3rd Ed.), and most of the quoted passages are from that work.

is towards their entire loss, and in the more highly specialized families there is never more than one joint."

At the tip of the proboscis, or very near it, is a pair of larger or smaller organs, generally distinctly visible, and more or less oval in shape, known as the *labella* or lips. Their function varies considerably, in some groups representing merely an apparatus for holding, in others they are evidently sense-organs, being "provided with hairs inserted in small semi-translucent spots on the outer sides and margins." This is the case in most flower-haunting flies, SYRPHIDÆ for example. In the majority of Diptera the labella are of fair or considerable size, and are provided with radiating ridges on the inner opposable sides. These *pseudotracheæ*, as they are called, "serve as a means of attrition, by which the insect rubs off particles of food from firm substances." In at least one family, the ASILIDÆ, they are rigid and horny. "Sometimes the labella are long and slender, and are folded back under the labium when at rest."

The mouth-parts in some Diptera are quite rudimentary, attaining their most abortive state in the ŒSTRIDÆ, in which they are almost absent.

The antennæ.—These organs exhibit a wider range of variability than any other in the Diptera, and to the beginner offer many puzzles, although a moderate amount of study will enable one to discriminate between the nematocerous, brachycerous, and muscid types, of which the latter is somewhat quickly recognised, although some Syrphid antennæ may easily be confused with it at first sight.

As a means of classification the antennæ have always been regarded as furnishing one of the most fundamental characters. It is significant that so long ago as 1802, when Latreille made the first real attempt at classification by dividing the Diptera according to the palpal and antennal characters, the long filiform nature of the many-jointed antennæ, combined with the elongate four- or five-jointed palpi, was seen to be typical of the NEMATOCERA (this term being introduced by Latreille in 1817); whilst the short three-jointed antennæ, coupled with the one- or two-jointed short palpi, of the rest of the Diptera were acknowledged as the characteristics of the BRACHYCERA, the latter term having been proposed by Macquart in 1825. The valuable systematic characters contained in the venation did not occur to dipterologists until years afterwards.

In the NEMATOCERA the antennæ are always more or less elongate,* often conspicuously so, composed normally of eight to sixteen distinct joints; in a few cases, as in some males of species of *Eriocera* in TIPULIDÆ, of six joints only; and in some other instances, of as many as twenty-eight: in fact some authors have

* With the exception of ORPHNEPHILIDÆ, a group of only five species representing a single and altogether anomalous genus.

claimed thirty-nine in a particular genus of CECIDOMYIDÆ (*Cerozodia*), but this has been disputed on the grounds that some of the joints are merely annular impressions. *Rhachicerus* (LEPTIDÆ) has twenty-eight joints, and some genera of CECIDOMYIDÆ possess this number also.

The antennæ in the BRACHYCERA consist technically of only three joints, but in some genera (*Hexatoma* in TABANIDÆ, *Xylophagus* and *Rhachicerus* in LEPTIDÆ) the 3rd joint is either distinctly or apparently divided into several joints, so that at first sight it is not easy for a beginner to distinguish the location of a species by the antennæ alone. But in all such cases the very short palpi and the totally different scheme of venation afford a certain clue to their identity.

In the NEMATOCERA the two basal joints are almost invariably differentiated from the rest, and are known as the *scape* or *scapus*, the remaining joints being called the *flagellum*. The scape nearly always bears a few stiff bristles, either irregularly placed, or arranged in one or two more or less distinct rows near the apical margins; it is sometimes bare or practically so, but never verticillate. The flagellum in most of the TIPULIDÆ and in some other groups, bears a whorl of fine hairs symmetrically arranged (in the TIPULIDÆ a very common number is four, two above and two below, the upper ones often the longer) around each joint, and the antennæ are then spoken of as verticillate. This is the normal form of antenna in the TIPULIDÆ. A few genera in that family have pectinate antennæ in the male, that of the female being verticillate or much less conspicuously pectinate. The CHIRONOMIDÆ and CULICIDÆ normally possess excessively plumose antennæ in the males, those of the females being generally verticillate, whilst CECIDOMYIDÆ generally possess verticillate antennæ in both sexes.

In the CYCLORRHAPHA only three joints are present, of which the first is always short, often extremely so, the third frequently being annulated, or possessed of a number of finely impressed lines giving the appearance of a number of joints closely annealed. It is curious that in these latter cases the 3rd joint never possesses more than seven such annular impressions, thus suggesting eight annealed joints, because the nematocerous antennæ most likely to be confused with such a form are those like *Bibio*, *Plecia*, etc., in which the flagellum generally consists of eight subequal homologous joints (though perfectly distinct from one another), whilst the two basal or scapal joints have some considerable resemblance to the first two joints of the antenna in *Xylophagus*. It is this latter form, which is by no means infrequent, that may be mistaken by the beginner for an eight-jointed nematocerous antenna. However, in all such doubtful cases the structure of the palpi and the distinctly different venation immediately decide the question of affinity.

With the Cyclorrhaphic antenna we have little to do in this volume, but it may be stated that although it consists of three

joints only, the terminal joint takes the most varied and at times extraordinary shapes, and may be elongate and porrect as in *Ceria* (SYRPHIDÆ), elongate and pendant as in the higher MUSCIDÆ, short and rounded as in most of the ANTHOMYIDÆ and ACALYPTRATA. It may be furnished with an *arista*, a long, gently curved, bristle-like hair, which may be plumose, subplumose, pubescent, or bare, or even extraordinarily pectinate as in one or two abnormal genera of Tachinids; the arista itself may be dorsal, subapical, or apical, or may be replaced by a more solid style-like appendage.

The Thorax.

Little can be added to the notes given under "Terminology." In most Diptera the mesothorax, usually known as the mesonotum when only its upper part is referred to, occupies the greater portion of that part of the body; both the prothorax (except in some TIPULIDÆ) and metathorax being very much aborted.

The thorax is normally oval or subquadrate; in many genera exceedingly elongated (*Calobata*, *Micropeza*); in others highly arched (*Simulium*, *Platypeza*, *Hybos*, CYRTIDÆ, etc.). In rare instances the sides of the thorax are furnished with a strong spine (*Ephippium*). The sides of the thorax or the pleuræ have been described above (p. 6).

The scutellum is variable in relative size, but is most frequently semicircular or subtriangular. It reaches its most extraordinary development in *Celyphus*, in which it forms an enormous spherical cover for the whole of the abdomen, and as the insects are generally smooth and shining, and of a metallic blue, green, or yellowish colour, they are easily mistaken by the beginner for beetles. The scutellum may be distinctly spined on the posterior margin (as in many STRATIOMYIDÆ), serrate, smooth, furnished with bristles or pubescence, or quite bare.

The metanotum is in most cases hidden by the scutellum above, except in some families of NEMATOCERA in which it is often the more conspicuous of the two. The vestiture of the thorax is as variable as that of the abdomen.

The Abdomen.

The abdomen in the Diptera varies in the number of segments from four (some ANTHOMYIDÆ and ACALYPTRATA) to as many as nine (in some MYCETOPHILIDÆ); the normal number in the NEMATOCERA being eight. The basal segment is often much shortened and almost invisible from above, the first two being sometimes more or less fused together. They are numbered from the base, on the upper side, the genital organs not being counted as a separate segment.

The variations in shape of the abdomen are very great. It is very elongate, narrowed, and cylindrical in TIPULIDÆ, CHIRONOMIDÆ, and CULICIDÆ; stout and shorter in some of the other nematocerous families; very short and exceedingly broad and

convex in many genera of STRATIOMYIDÆ; globular and almost transparent in CYRTIDÆ; oval or conical, as in most SYRPHIDÆ, and other families of BRACHYCERA, and most of the higher MUSCIDÆ; elongate and cylindrical in ASILIDÆ, DOLICHOPIDÆ; subtriangular in many ANTHOMYIDÆ and ACALYPTRATA.

In vestiture it varies also; thick long spines are present in many genera of TACHININÆ; in others, bristles, ordinary pubescence, a pollen-like dust, or scales may form the covering.

The male genitalia in the Diptera exhibit the most diverse modifications, and in many groups afford reliable specific characters. Their taxonomic importance, however, must not be overrated, and it must be recognised that they exhibit great variability, even in the same genus. They reach probably their greatest development in the DOLICHOPIDÆ, but are quite conspicuous in many TIPULIDÆ, MYCETOPHILIDÆ, ASILIDÆ, and some smaller groups.

The female genitalia are much more uniform than those of the male, consisting in the principal families of the NEMATOCERA of a pair of oval terminal lamellæ often withdrawn into the body-cavity, and in the TIPULIDÆ of a pair of exterior pointed valves; whilst in nearly all of the BRACHYCERA and the MUSCIDÆ no organs are visible exteriorly.

The Legs.

These organs vary throughout the order to an extraordinary degree, from the exceptionally long and delicate legs found in *Dolichopeza*, *Cylindrotoma*, and other TIPULIDÆ, to the short incrassated ones in some of the EPHYDRINÆ and other groups of Acalyptrate MUSCIDÆ. They may be conspicuously dentate, strongly spinose, bristly or practically devoid of hairs, densely pubescent, or ciliate. Frequently the femur, tibia, or tarsus, or one or more joints of the latter may be incrassate, or occasionally fantastically formed, such modifications being at most generic, often not of even that taxonomic value.

The Wings.

So far as the perfect insect is concerned, the venation of the wings is, for purposes of classification, the soundest and most reliable structural character in Diptera. The exceptions, though admittedly numerous, are of such a nature that although doubt as to their exact systematic position may at first arise, they can never be actually identified with a wrong family. Many families or groups of families in the Diptera possess strikingly peculiar types of venation of their own. Outside of the NEMATOCERA, one soon learns to recognise, for example, the wing of a Stratiomyid from the faintness of the veins near the posterior margin of the wing and the equally unusual "crowding-up" of the veins near the anterior margin; and a Dolichopid may be known by the peculiar "kink", that is present in so many of the genera in that family, placed about the middle of the 3rd and 4th longitudinal veins; while the SYRPHIDÆ may be distinguished by the upturned

ends of the 4th and 5th veins, approaching the Muscid type, yet quite distinct from the true Muscid form as developed in *Musca* itself and its allies.

The CONOPIDÆ, PIPUNCULIDÆ, PLATYPEZIDÆ, ŒSTRIDÆ, and PHORIDÆ have each one a striking and typical venation of its own. Even in the vast mass of the MUSCIDÆ, *sensu lato*, three tolerably distinct types are present that contain the great majority of the species; these may be termed the Tachinid, the Muscid, and the Anthomyid respectively. The ACALYPTRATA, although nominally of the same general plan as the latter type in venation, are as a rule easily distinguished by the small, equal-sized, or absent wing-scales or tegulæ, which in the ANTHOMYIDÆ are conspicuous and of unequal size.

Among the other families of BRACHYCERA the student may at first, from the wing alone, find it difficult to distinguish between, say, the TABANIDÆ, LEPTIDÆ, and THEREVIDÆ; the various forms of BOMBYLIIDÆ and ASILIDÆ, with the allied smaller groups; and the somewhat erratic types met with in the EMPIDÆ; but this discounts but little the pronouncedly characteristic forms of the other families, and a wider experience will enable him to determine between these more allied types of venation.

Reverting to the NEMATOCERA, the CECIDOMYIDÆ, CHIRONOMIDÆ, SIMULIIDÆ, BLEPHAROCERIDÆ, DIXIDÆ, and TIPULIDÆ at least have quite characteristic venation. That of the CULICIDÆ and PSYCHODIDÆ is allied and, with the RHYPHIDÆ, may at first appear to resemble the TIPULIDÆ, but a short study will enable the student to differentiate them without much difficulty. The remaining families are not so distinctively characterised, and in these closer examination is necessary.

Terminology of venation.—As may be surmised, various systems of venational terminology have been constructed, but, since this is hardly the place wherein to enter into a discussion of their respective merits and demerits, it will be only necessary here to fully describe the system adopted in the present volume. Practically, it is a somewhat modified form of Schiner's terminology as used in his 'Fauna Austriaca,' and as adopted by the principal dipterologists up to the present day.

Osten Sacken, who, according to Schiner,* used a very old-fashioned and unsatisfactory terminology employed by Walker and others of that period, entirely abandoned it in after years, and the system accepted by him in his celebrated monograph of the North American TIPULIDÆ (1869) was the basis of all his subsequent work.

Of other systems, mention may be made of that of Schummel, mainly because he wrote extensively on TIPULIDÆ, but he named all the posterior cells backwards, that is, what is now called the 5th was his 1st, and he treated the two submarginal cells as posterior cells, calling them the 6th and 7th.

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* Fauna Austriaca, ii, p. xxv.

The Comstock-Needham system was invented by the former author and elaborated by the latter. Though it must be admitted that Needham's researches into the homologies of the veins, not only in Diptera, but in other orders of insects also (especially Neuroptera), are, so far as I am able to judge, perfectly consistent, there seems no necessity to alter the almost universally adopted names of the veins. Moreover, the abbreviations used to designate the veins in this new system of venation, such as, Cs 2, R 4+5, M 1+2, and so on, can never convey the decisive meaning of terms of obvious significance, such as, costal cell, marginal cell, 1st, 2nd, 3rd longitudinal vein, &c., all of which by their very names at once define their position in the wings. Of all recent systems of terminology I cannot but regard this one as the least acceptable. However, in spite of wholly disagreeing with this system of venation, I must accord Mr. Needham every praise for the excellent series of Tipulid wings published by him, which has been most invaluable to me during my present studies in this family.

It must be remembered that modifications to suit special forms are almost imperative, whatever system of classification be adopted, for it is obvious that since some wings are replete with veins, whilst others have very few, it must be a matter of careful study to decide which are the veins that persist in these latter cases. It is not therefore merely a question of an arbitrary and artificial naming of the parts at caprice.

Osten Sacken may be quoted here with advantage:—"Thus, if we force upon the TIPULIDÆ the terminology introduced originally in the families of Diptera with a less developed venation, we meet with inextricable difficulties. But there is no more reason for doing so than for following the opposite course, adopting a terminology for the TIPULIDÆ first and forcing it afterwards upon the MUSCIDÆ. It is perfectly arbitrary at which end of the system of Diptera we begin to trace out the homologues of the venation. This study of the homologies has two distinct aims in view; the scientific aim of showing that the ground-plan of the venation is the same in all the families of the order, and the practical aim of adopting a terminology for descriptive purposes. We cannot carry out a terminology on solely theoretical grounds, we will have to vary the details of it according to the peculiarities of structure occurring in different forms, the main plan remaining the same."

2. INTERNAL ANATOMY.*

"The special features of the internal structure of the Diptera are the high degree of concentration of the nervous system attained in some members of the order; the expansion of the

* The works of Brauer, Brandt, and Künckel d'Herculais are recommended by Dr. Sharp to the student of internal anatomy in Diptera. Williston has drawn largely on Kellogg, and the notes herein offered are compiled from this source, the present writer never having studied the subject.

two main tracheal trunks in the base of the abdomen to form air-sacs, the presence of the sucking-stomach as in the Lepidoptera, the constant number (four, rarely five) of the Malpighian tubes, and the absence of a bursa copulatrix in the females."*

The alimentary canal presents behind the œsophagus, an expansion known as the diverticulum or sucking-stomach,† the ventriculum or true stomach lying behind it, with, usually, two cæca. The heart is of the usual type, but in the more specialised families has two chambers only. "In the larva of *Corethra* the heart is a simple elongated tube without chambers." The two main tracheal trunks expand at the base of the abdomen into conspicuous air-sacs. The two pairs of spiracles of the thorax are provided with "vocal cords" and it is these that cause the humming when the fly is on the wing.

The nervous system in the Nematocera generally comprises five or six abdominal ganglia and three distinct thoracic ganglia. Intermediate forms are numerous between this type and those of the Muscidæ, in which the abdominal and thoracic ganglia are united into a large mass in the thorax. A minute structure called Johnston's organ, placed in the 2nd antennal joint, is supposed to contain the auditory nerves.

The internal genital organs consist in the male of two oval testes with short vasa deferentia, a well developed penis with accessory copulatory appendages, which are of the most diverse structure even in allied species of the same genus. In the female the ovipositor is remarkably uniform; there are a large number of egg-tubes, three spermathecæ, paired accessory organs, and no true bursa copulatrix.

3. The Early Stages of Diptera.

The Larva.

The larvæ of all Diptera are destitute of jointed legs. The larvæ of other groups most resembling them are those of the Curculionidæ (Coleoptera), but whereas these latter have little or no power of locomotion, the larvæ of Diptera can generally move about freely by means of projections on the body called pseudopods; or by the aid of short bristles arranged so as to favour progression, such being present even in completely maggot-like forms.

The spiracles are also of great aid in enabling us to decide whether a larva is Dipterous or not.

Schiner counted thirteen segments in the larva, first the head, then three representing the thorax, the remainder forming the abdomen. "There is, however, no morphological criterion yet

* This is from Williston, after Kellogg.

† This function of this organ has been questioned.

discovered, by which the segments can be numbered, and in many cases the segments cannot be satisfactorily delimited in the present state of knowledge." (Dr. D. Sharp, in Verrall's "British Flies," vol. v, p. 32.)

Many Dipterous larvæ have no distinct head. These are known as ACEPHALA, as distinct from the EUCEPHALA, or those furnished with a distinct head. The ACEPHALA include flesh-eating maggots. The term "hemicephalous" has been used by Dufour and others for those larvæ in which the head end is of an intermediate form, that is to say, not possessing a sufficiently distinct head to be included in the EUCEPHALA; and the majority of the families appear to fall into this intermediate division. In these cases the head part is withdrawable within the body, after the manner of a tortoise.

"Dipterous larvæ have the last pair of spiracles largely developed, and they are frequently placed at the actual tip of the body; when not at the tip, they are usually placed dorsally rather than laterally. These are points of distinction as compared with other orders of insects. When the posterior spiracles are the only pair that exists, the larva is said to be *metapneustic*; when in addition to these, there is an anterior pair placed a little behind the head, the larva is *amphipneustic*; when there are also intermediate spiracles the larva is *peripneustic*. The frequency of the metapneustic and amphipneustic systems is characteristic of Diptera, the peripneustic system being the usual one in other orders." (Dr. D. Sharp.)

The Pupa.

The pupa in the ORTHORRHAPHA is "either a free, so-called mummy pupa, or it remains enclosed in the larval skin, which it bursts open at its emergence in the form of a T-shaped fissure on the back, or by an irregular sort of lid at the end of the head." (Brauer.)

In the CYCLORRHAPHA "the pupation always takes place in the larval skin, which hardens and becomes like a barrel. Previous to this, the larva possesses on the 4th or 5th front segments, an arched seam, produced horizontally, and extending above the mouth, which seam encloses enough of the surface of the barrel for the emerging flies to burst off as a lid by means of the frontal bladder." (Brauer.)

The Habitats.

The habitats of the Diptera in their earlier stages are most diverse. A large proportion are aquatic (CULICIDÆ, CHIRONOMIDÆ, STRATIOMYIDÆ, TABANIDÆ, EPHYDRINÆ, etc.), some like *Eristalis*, in the SYRPHIDÆ, preferring rank pools or drains; quite a large number live in the earth, as do many TIPULIDÆ, some THEREVIDÆ and EMPIDÆ; others in rank or rotting vegetable matter,

(Asilidæ, Dolichopidæ, Syrphidæ, and many groups of Muscidæ); some form galls (Cecidomyiidæ), some breed in fungi (Mycetophylidæ and Platypezidæ); many are leaf-miners (many Anthomyinæ, most of the Trypetinæ, and some Ortalinæ); whilst the vast majority of the enormous family Muscidæ breed in rotting animal or vegetable matter, as do also many groups of other families, in fact this habitat might be considered the most general one in the order. A few are parasitic; some Bombyliidæ and Conopidæ on Orthoptera and Hymenoptera; the Œstridæ on Mammalia; Cyrtidæ (probably) on spiders. Pupipara are parasitic in the adult state also, on mammals and birds.

These give only a few of the general habits of the larvæ.

As regards the habitats of the perfect insect it need only be said that a great proportion of the species may be met with almost anywhere on the country-side, although many prefer specially suitable localities, or remain throughout life more or less in the vicinity of their birth, thus, in one way, accounting in conjunction with their environment, for the occurrence of some of the races or varieties.

The peculiar kinds of situations favoured by each family are mentioned in their proper places.

4. On the Collecting of Diptera.

Although some groups of Diptera are sufficiently robust to allow the collector to handle them pretty freely, it will be well for him to start with the paramount impression that as much care must be taken both in their capture and subsequent treatment as would be required in the case of Microlepidoptera. The delicate pubescence with which the majority of the species are covered is easily removed by a careless touch, and such groups as the Bombyliidæ, Therevidæ, and Psychodidæ require very careful handling on this account.

In other groups the chief danger is the fragility of the legs; such are the Tipulidæ, Mycetophilidæ, Culicidæ, and Chironomidæ, amongst the Nematocera, and the Leptidæ, Dolichopidæ, Tachinids and Anthomyids amongst the Brachycera and Cyclorrhapha. In other groups again, the delicate spines break off at the least touch (in Sepsinæ for instance), often leaving no trace.

Numerous methods of collecting are known to all, and the reader is probably already acquainted with many of them. Personally, I have for twenty years collected with the ordinary butterfly net (white, not green, as it shows up the insects better), capturing the larger specimens singly and then with a little manipulation removing them with the fingers and placing them in a chip or pill-box alive. After a little practice quite a number can be placed in one box, the specimens being brought home alive, and killed without delay by inserting a little powdered naphthaline

into the boxes, upon which they die in a thoroughly relaxed state, ready for pinning. From a quarter to half an hour should be allowed, as if removed sooner, some may recover. Naphthaline is preferable to chloroform as the latter stiffens the leg muscles, making them brittle and easily broken, or causes the insects to fold their legs very tightly under their bodies.

The fumes of burning sulphur are applicable, but it is possible they may act chemically on the colours in some groups.

Rare species should always be given a small box to themselves.

"Sweeping," *i. e.* dragging the net through a field of grass and clover or along the sides of dry or wet ditches, is a prolific method of acquiring a great number of specimens in the shortest space of time possible, but a good proportion of them will be lost by damage. After "sweeping" for a minute or two, the contents of the net are shaken to the bottom of it by means of two or three sharp jerks, the net pinched with the left hand just above the mass of seething insect life, when with the right hand a large chip-box can be gradually inserted and the sides of the net strained over it with the left hand, after which with very little manipulation the lid can be replaced and the contents brought home alive.*

Of course delicate insects will suffer by this treatment, but great numbers of the hardier kinds are easily obtained thus. Predaceous flies must not be kept in the same box with soft-bodied ones—a hungry *Asilus* for instance, with a Leptid or Anthomyid. One soon learns with a little experience which kinds may be safely mixed and which must be kept apart.

Glass tubes are useful for capturing single specimens on walls, tree-trunks, large leaves, windows and so on, but specimens should never be left long in them, as moisture collects and ruins the pubescence, and, in the case of small specimens, the wings also.

A small wad of wool soaked with chloroform must be pushed to the bottom of the tube and covered by a round piece of card-board closely fitting the tube, with several fair-sized holes punched in it. Or the bottom of the tube may be filled with plaster-of-paris in which a piece of cyanide of potassium is buried. The effects of this are much more permanent than chloroform, which requires constant renewal. As soon as the insect is stupefied it should be placed in a chip- or pill-box, where it will recover and can then be brought home alive and killed by naphthaline.

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* Thisi s the method I have nearly always followed from my predilection for bringing specimens home alive, because if killed early in the day they are too stiff by the time one reaches home to be pinned successfully; but if a large-mouthed cyanide bottle does not incommode the collector in the field, the end of the net may be inserted bodily into it for a few minutes, and then the dead insects turned into a dry chip-box. This has the advantage of killing the small spiders that generally form part of the capture and which always take their toll of it.

5. The Mounting and Preservation of Diptera.

Regarding the mounting of specimens for the cabinet, a great deal has been written, and it is not proposed to dilate on the subject here.

Some specialists prefer specimens in alcohol, asserting that the more delicate parts of the body, such as the structure of the mouth and antennæ, and the genital organs of the male, are more easily viewed thus, through remaining soft, whereas in dry specimens they are liable to shrinkage, and possibly a certain amount of distortion, their relative proportions thereupon being lost. Those who prefer specimens in spirit are generally workers in those groups that I have never studied myself, Cecidomyidæ, Chironomidæ, etc., and therefore it might be presumption to appear to dictate as regards these families; but individually I have a very great distaste for any Diptera so preserved.

The relative proportions can be noted during life, as Osten Sacken did in many instances of Tipulid genitalia, antennæ and so on; and dried specimens are infinitely easier to handle, they preserve their colours in the vast majority of families for as long as probably nearly a hundred years, if kept in suitable cabinets, properly supervised, *in a temperate climate*, and lastly their external vestiture is retained in its natural state. Pubescent species, such as Bombyliidæ, Asilidæ, Therevidæ, etc., are most certainly utterly ruined, if placed in alcohol (Williston says *all* specimens so preserved are worthless); the insect when lifted from the liquid bearing no possible resemblance, in its bedraggled condition, to its natural appearance.

It should be hardly necessary to state that Diptera gummed on slips of card are not to be tolerated either, as the underside is thus rendered practically invisible.

Therefore I, personally, *pin everything*, using Carlsbad white (not steel) pins: nos. 4 and 5 for the very largest Asilidæ, Tabanidæ and so on; no. 3 for ordinarily large flies, and nos. 2, 1 and 0 for the great bulk of the species. Nos. 00 and 000 are too fine to use by themselves, and I prefer at that stage to resort to the short very fine pins used for very small Lepidoptera, made by Kirby and Spence, also the "minutien nadeln" (without heads) manufactured by some German firms. These I should employ for species of the size of *Simulium*, for the bulk of the Mycetophilidæ, the Chironomidæ, Culicidæ and others of similar size.

When mounting specimens on full-length pins, the latter should pass through the middle of the dorsum of the thorax, and the insect be placed sufficiently high up the pin to leave only sufficient room above it to grasp the pin easily with the forceps; and in a properly mounted collection the dorsum of all the specimens would be at the same cabinet level (fig. 6, *a*). This very greatly facilitates examination with the lens, often rendering it unnecessary to remove the lid of the cabinet drawer.

If the specimen is one with very long and delicate legs, so that pinning straight through the thorax would be liable to break these off, it may be pinned a little towards the side, the pin emerging from the other side just above the coxæ. The specimen is even then more or less perpendicular.* This applies chiefly to Tipulidæ. The wings should never be crossed over the abdomen but allowed to stand out in a natural manner sufficiently clear of the body to allow an uninterrupted view of every part of the

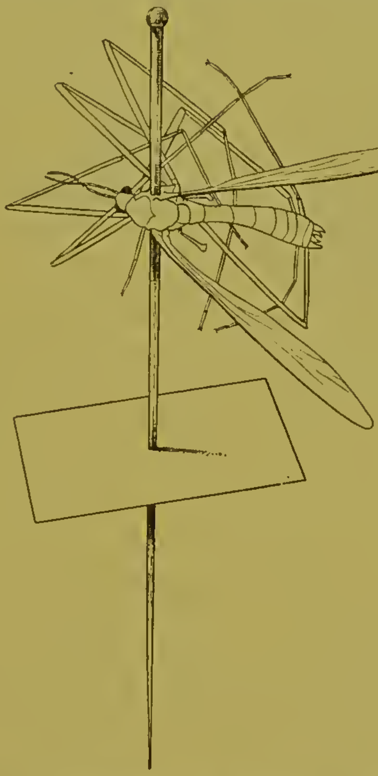

Fig. 5.—Method of mounting a Tipulid.

latter. They should never be spread out horizontally at right angles to the body after the fashion adopted in "setting" Lepidoptera.

The legs should not be allowed to fold up close under the body, but be pulled out sufficiently clear for one to examine easily all parts of them and of the ventral surface of the insect, and at the same time not allowed to stick out at ungainly angles (a prevailing disposition of many Tipulidæ) threatening destruction every time they are touched: nor should they hang down (this also especially applies to Tipulidæ) so that they touch or nearly touch the bottom of the cabinet drawer.

The same rule applies to the antennæ. This is because there

* The insect in the figure is shown entirely on its side; it should be in a position half-way between horizontal and vertical.

must always be left sufficient space below the insect for at least two or, perhaps, three labels, and room again after that for the forceps to grasp the pin.*

In pinning small and very minute Diptera with the short, very fine pins, they are best pinned when lying on the *left* side, the pin passing through the thorax just below the dorsum, and at such an inclined angle that it emerges from the lower (left) side just above the coxæ. By thus piercing the thorax obliquely, it is possible, by slanting the pin slightly when mounting it on pith or

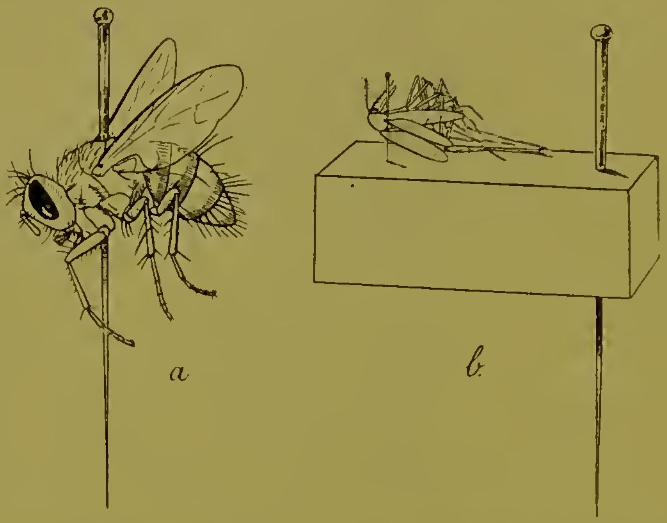

Fig. 6.—Method of mounting (*a*) a moderate-sized fly, (*b*) a very small fly.

cork, to enable the student to examine both the dorsum and the right side of the insect without removing it from the cabinet. These minute pins should carry the specimens as near their heads as possible, and be stuck in neatly-cut, oblong pieces of white pith or similarly shaped pieces of cork covered with white paper. These pieces of pith should be broad and long enough to protect the head and legs to a moderate extent, but no broader, otherwise it is impossible to place a strong hand-lens near enough to examine details. Moreover the pith should invariably be of some *depth*, as this secures a tighter grasp of the large pin which must be thrust through the end of the pith opposite that bearing the specimen.† A dot of white gum placed on the upper side of the pith on the spot where the small fine pin is inserted will fix it securely and a larger drop of gum should be placed around the strong pin where it emerges from the *under* side of the pith. Some collectors, however,

* In removing a delicate specimen from the cabinet the forceps should grasp the pin *above* the insect; in replacing it, the forceps should grasp the pin *below* the insect, thus in each case minimising the chances of accident.

† When fixing the small pin in the pith the head of the insect must be directed away from the strong pin, not facing it, as the latter method adds to the difficulty of viewing the head parts.

prefer not to gum the specimen into the pith, so that it can be removed for closer microscopic examination when necessary. In the case of the excessively minute forms they should be pierced from below the body, the point only of the very smallest pin being inserted so as only just to emerge from the dorsum, the head end of this pin (there being, as said before, no real enlargement as a "head") being stuck in the pith, but in this case it is most advisable to gum the pin in the pith, it being much more likely to fall out when inserted, so to speak, upside down.

For the closer examination of the anatomical structure of very small Diptera, as PSYCHODIDÆ and all those of still lesser size, it is convenient to mount some of the specimens on microscopic slides, preferably in a more or less dissected state; but this method has at least one disadvantage, that it frequently destroys all the exterior characters, such as pubescence, spines, bristles, all of which are valuable specific points of difference. So that unless the species depends solely upon some anatomical structure quite invisible to the naked eye, it should be identified whenever possible *before* mounting it on a slide, as it is otherwise often impossible to do so, many of its external characters being afterwards unavailable. The venation of some of the very pubescent PSYCHODIDÆ is absolutely invisible until the wings are denuded of the very thick hairs with which they are covered, augmented in many cases by the addition of semi-opaque imbricating scales. It is very difficult to determine a single specimen of such a species unless one wing be broken off and mounted for the microscope, the other one remaining intact on the dried specimen.

A new process has somewhat recently come to my notice; this is the imbedding of the specimen bodily in an alcoholic solution of collodion, with a backing of a mixture of oxide of zinc and canada balsam, the collodion protected above by a "cover slip" of glass, and the whole mounted on a microscopic slide. The head, wings and legs are arranged so as to be easily examined and there is no danger of the specimen meeting with any damage.

This process, although it has the advantage of presenting a perfectly stereoscopic view when seen under the microscope, has the serious disadvantage of only one surface, dorsal or ventral, being visible in any individual specimen; so that unless the identification of each specimen be done by the collector (who in very many cases is himself not a specialist) before mounting, considerable doubt is liable to attach to the specimens from the inability of the actual specialist to examine both sides of the same individual. In the cases of very closely allied species known to occur in the same neighbourhood the positive identification of a large proportion might be impossible.

The only way of retaining specimens permanently in good condition* after being properly mounted is by their inclusion in

* A collection of Diptera, if the specimens be thoroughly *dried* at the start, and preserved in a cabinet as described, in a temperate climate, should remain in good condition for not less than a hundred years.

a well-made cabinet of mahogany, oak or teak; the latter wood being the only one that will survive the climatic conditions of the tropics, and even then only in certain regions and with the greatest possible continual care. In all climates in which there is much moisture, a small wad of wool soaked in carbolic acid or creosote must be retained in a corner of each drawer to prevent mould, and the liquid constantly renewed. Naphthaline, camphor or creosote must also be kept in the grooves made for this purpose to keep away mites or similar creatures.

Diptera will keep in excellent condition in temperate climates in well-made wooden or even cardboard store-boxes, if made with tightly fitting lids and kept in a dry room.

6. Standard Works for Students.

The easiest way in which a beginner can obtain a good insight into the families of the Diptera is to obtain tracings, drawn by himself if possible, from plates and figures of the *wings* of a few of the leading genera of each family (or at all events, of all those genera that give their names to the families), and then to arrange them in a copy-book, leaving ample space for additions and notes. To the wings may advantageously be added the corresponding antennæ and palpi. An even moderate study of these placed side by side in their systematic sequence, added to the general appearance or "*facies*" of the different families—a perception he will easily acquire—will give him the quickest preliminary knowledge of classification possible.

As the soundest introduction to the study of the whole order there is no work to be compared for reliability and conciseness, with Schiner's "Fauna Austriaca, Diptera," in two volumes (1862–1864). The tables of genera are in themselves a mine of information.

In addition to this work may be earnestly recommended Prof. Williston's 3rd edition of his "North American Diptera" (1908). It is fully up to date, has the advantage of being in English, and is profusely illustrated by diagrams of wings and other parts of the body. These two works in conjunction will make the student acquainted with many hundreds of genera, a large proportion of which are cosmopolitan or nearly so. Both works are easily obtained at a moderate price.* For minuteness of detail and the full history of synonymy in the families dealt with, Mr. Verrall's huge work on "British Flies" should, when completed, be the standard work on the order for the next century. Other works which are absolutely indispensable to the earnest student, especially of exotic flies as well as European species, are: Meigen's "Systematische Beschreibung, etc.," Wiedemann's "Aussereuropaische zweiflugelige Insekten," Macquart's "Diptères

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* About thirty-two shillings and sixteen shillings respectively.

exotiques," Zetterstedt's "Diptera Scandinaviæ," Walker's "List of the dipterous insects in the British Museum," and "Insecta Saundersiana," Bigot's "Diptères nouveaux, etc.," Schiner's "Reise der Novara" and the "Biologia Centrali-Americana." Everything written by at least Loew, Osten Sacken, Schiner, Williston and Van der Wulp should be obtained, whilst the works of Rondani and Robineau-Desvoidy, though less reliable, are always in requisition. All the writings of living dipterologists should also be consulted.

7. Estimated number of known species.

The Diptera, or two-winged insects, may be regarded as represented by about 35,000 described species. Of these some portion will, of course, be ultimately relegated to synonymy, but, even after deleting these, the remainder in all probability represent but a tithe of those actually existing throughout the world.

Many regions have been practically unexplored by the collector. Such parts are the bulk of the South American Continent, where many thousands must remain to be discovered in the immensely fertile valleys of the Amazon, Orinoco, La Plata and other large rivers, and in the teeming tropical districts of the northern part of the Continent. Africa is at present almost unworked, save for the Mediterranean shores, Egypt, Italian East Africa and the Cape; none of these, moreover, having been treated to a tenth part of the study that has been given to the Diptera of Western Europe. Australia, judging from what I possess of unnamed material in my own collection, must eventually yield a rich quota; Skuse, the only writer in that country, gave 10,000 as a reasonable estimate of the species probably existent there. Besides these, there are large areas in Asia and even in Eastern Europe which have hardly been touched by the collector. A very large number of species must still remain to be discovered in the vast North American continent, whilst lesser worked regions of the New World, Mexico, Central America and the West Indies will certainly double or treble their present lists of species, if the enormous increase during the past three or four years in the known forms of the Oriental Region in such groups as have been more thoroughly worked, is any criterion.

For instance, no family has ever been so systematically or assiduously collected in such a number of varied districts throughout the world as have the Culicidæ during the past ten years or thereabout, and the enormous increase in the recorded species in this family (even allowing for a large proportion of synonyms or varieties only, as was suggested by me a few years ago),* seems to foretell a grand total throughout the whole order of incredible

* "Catal. Orient. *Culicidæ*," Rec. Ind. Mus. i, p. 297.

magnitude, if other families, as may reasonably be supposed, are as prolific of new forms as the CULICIDÆ have proved.

Schiner in 1868,* in noting that 19,449 species were at that time known, distributed them geographically as follows:—Europe 8670, Asia 2046, Africa 1644, America 5577, and Australasia 1056, the remaining 516 coming from unknown localities. In Hardwicke's 'Science Gossip,' fifteen or more years ago, calculating *pro rata* according to geograpical areas, I estimated 200,000 as a quite moderate estimate of the number of species in actual existence!

The Palæarctic Catalogue, recently issued, gives a little over 13,000 † as inhabiting the Palæarctic Region up to the year 1907; Aldrich accumulates about 9000 species indigenous to North America ‡; Van der Wulp's Catalogue of South Asian Diptera totalled 2889 up to not later than 1906; whilst a manuscript Catalogue of my own compiled on the recorded Australasian Diptera includes about 2000 (up to 1909), to which I am continually making additions that have been overlooked.

The gigantic Catalogue of the world's Diptera, by Prof. Kertész, now in progress, gives a total of about 13,600 species as known in the families at present dealt with; that is to say, the NEMATOCERA and practically all the remaining families except the MUSCIDÆ If this last enormous family bears the same proportion in the world's species as it does in the Palæarctic fauna, it should comprise 14,000, making a total of between 33,000 and 34,000 as actually known from all parts of the world.

But since the publication of the two volumes containing the NEMATOCERA, something like 500 species of CULICIDÆ alone have been described, whilst my own labours in this suborder will result in the erection of considerably over 300 more (including those in this volume), without touching the CULICIDÆ, CHIRONOMIDÆ and CECIDOMYIDÆ, and these 300, moreover, are from the Orient alone. Prof. Kieffer has added about 250 species to the CHIRONOMIDÆ and a limited number to the CECIDOMYIDÆ, all these practically from the Indian Empire only.

To illustrate how small a region has been worked over, it may be noted that the Oriental NEMATOCERA were represented by only 230 species in Van der Wulp's Catalogue (1896), since which the number has been increased to 1200 or a gain of over 400 %. Moreover, even this great increase of species has been gleaned from a comparatively small number of localities, the bulk of them (with the exception of the CULICIDÆ) having been collected in three or four Himalayan districts of quite limited extent (Mussoori, Simla, Naini Tal and Darjiling); Calcutta and its immediate environs;

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* "Reise der Novara."

† This is an approximation: the actual number of species contained in each of the four volumes not being quoted by the authors, but the estimate is probably sufficiently near the truth for the present purpose.

‡ "Catal. North Amer. Dipt." (1905). The estimate is mine; the catalogue is compiled up to Jan. 1st, 1904.

perhaps half-a dozen Indian localities situated in the plains (Puri, Pusa, Purneah, etc.); a comparatively small tract in Travancore, South India (during one visit only); several localities in Ceylon; and perhaps half-a-dozen others in Assam and Burma. These localities do not represent a tenth part of the Indian Empire even allowing a fifty mile radius to each. Realising that the NEMATOCERA themselves only represent a fifth or a sixth part of the whole order of Diptera, the immense possibilities lying before the student will be apparent.

8. THE CLASSIFICATION OF THE DIPTERA.

It cannot be said that there is at present any universally accepted classification of the Diptera, although most authors are agreed on Brauer's primary divisions of ORTHORRHAPHA and CYCLORRHAPHA, and the secondary division of the former into NEMATOCERA and BRACHYCERA. The lesser subdivisions higher than families, especially amongst the BRACHYCERA, proposed by various authors on different groupings of families, are so numerous that it would be out of place in the present work to give them in detail, much less to discuss them.

Williston * gives in full Brauer's, Schiner's, Osten Sacken's and Coquillett's classifications, in order that the student in his study "may not reach the erroneous conclusion that any system is authoritative." He also gives a classification by a new writer on this subject, Lameere, but this author has been so severely criticised that his views are not included here.†

The division into ORTHORRHAPHA and CYCLORRHAPHA "may perhaps safely be accepted, since all, or nearly all, are agreed thereon, though by no means agreed as to their rank and limits."

Osten Sacken considered that the characters recognised as distinctive of the NEMATOCERA and BRACHYCERA are of more fundamental importance than those distinguishing the ORTHORRHAPHA and CYCLORRHAPHA, an opinion from which Williston differs, accepting Brauer's primary divisions as the truer biologically.

By far the most pertinent and concise account of the distinctions between the NEMATOCERA and BRACHYCERA, and the best and most elaborate synoptical table of families in the latter division is that in Mr. Verrall's monumental work on "British Flies." ‡ Biological notes of paramount importance are given of each family.

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* "North American Diptera," 3rd edition, p. 52.

† It seems out of place in the present work to dilate on the classification of this order as proposed by the very earliest writers. The works quoted may be consulted by those readers desiring this information.

‡ In vol. v.—"STRATIOMYIDÆ, etc."; the second of the two volumes at present published. Brauer's descriptions of his suborders and higher groups are translated in Mr. Verrall's first published volume (vol. viii.), and should be studied by those interested in the subject.

The subject of the higher systematic subdivisions of the Diptera has never received from me any special study, so that, perhaps, opinions on it are out of place, but I have always considered the NEMATOCERA and BRACHYCERA (by which latter I mean all the remaining families except the EPROBOSCIDEA) as a more natural classification of the perfect insects than the shutting off of the SYRPHIDÆ and allied families from the present-day "BRACHYCERA," and allying them to the Muscids in a common group, opposed to the NEMATOCERA and present-day "BRACHYCERA" combined.

If the ORTHORRHAPHA and CYCLORRHAPHA are recognised as the primary divisions, it seems to me that the secondary divisions might be called NEMATOCERA and ORTHOBRACHYCERA, in the ORTHORRHAPHA; and CYCLOBRACHYCERA, MUSCOIDEA (= MUSCIDÆ, *sensu lato*, plus PHORIDÆ) and EPROBOSCIDEA (or PUPIPARA), in the CYCLORRHAPHA.

I cannot help feeling instinctively that the most natural classification is into two suborders, NEMATOCERA and BRACHYCERA, the latter divided into two groups, the first containing all the families except the MUSCIDÆ* and PHORIDÆ, which together would form the second group. The PUPIPARA might either form a third group of the BRACHYCERA or constitute a third suborder. In other words, it seems unnatural to me to separate the SYRPHIDÆ, PIPUNCULIDÆ and PLATYPEZIDÆ from the families forming the present-day BRACHYCERA. The MUSCIDÆ as a whole seem to form a very compact, homogeneous group, quite different in external structure, appearance, and habits from the other Brachycerous families, and possessing a typical venation. The aberrant family PHORIDÆ seems most nearly allied to the MUSCIDÆ, through the BORBORINÆ or some allied group. The unfortunate part of the primary classification (though possibly biologically correct) into ORTHORRHAPHA and CYCLORRHAPHA is that that system affords no easy clue to the determination of the perfect insects, since the absence or presence of the frontal lunule is the only character offered and this moreover is either absent or inconspicuous in three families of CYCLORRHAPHA in which it should be present, including the extensive family SYRPHIDÆ. Since beginners certainly never commence their studies with life-histories, I defy any ordinary entomologist attacking the Diptera as a new study to sort out into their respective suborders a box full of mixed Diptera of many families. He would therefore inevitably be compelled to fall back on the old groups of NEMATOCERA and BRACHYCERA, eliminating the SYRPHIDÆ, PIPUNCULIDÆ, PLATYPEZIDÆ, MUSCIDÆ, PHORIDÆ and so on, by their respective very typical systems of venation.

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* I am convinced that the whole of the MUSCIDÆ should be included in a single family and that the Tachinids, Anthomyids and so on should rank but as sub-families, the various Acalyptrate groups each forming a subfamily of equal rank with them. The Dexids and Sarcophagids would be sunk in TACHININÆ, and the intermediate Calyptrate subfamily would be MUSCINÆ (in the old sense).

9. The Suborders of the Diptera.

The majority of authors have adopted Brauer's division of the order into Orthorrhapha and Cyclorrhapha, separated mainly according to the method in which the perfect insect escapes from the pupa-case. These suborders may be thus characterized :—

Suborder **ORTHORRHAPHA.**

Diptera in which the pupa-case is "mummy-like," more or less indicating the outlines of the imago, as in the common crane-fly or "daddy-long-legs" (*Tipula*).

The fly emerges from the dried larval skin forming the pupa-case through the T-shaped opening which is formed by a length-wise split on the back, near the head-end, and by a cross-wise split at the front end of this ; or (rarely) through a cross-wise split between the 8th and 9th abdominal segments. Adults without a frontal lunule.

Larva with a "jaw-capsule" (Kieferkapsel) or more or less distinct head. Pupa free, or enclosed in the larval skin.

Suborder **CYCLORRHAPHA.**

Diptera in which the pupa-case is oval or egg-shaped, with a comparatively smooth surface, bearing no resemblance whatever to the perfect insect. For example the common house-fly (*Musca*) and blow-fly (*Calliphora*).

The fly emerges from the puparium through a circular orifice made by the insect pushing off the head-end.* Adults possessing a frontal lunule.

"The frontal lunule is a small crescent-shaped piece immediately above the antennæ, which is characteristic of the second suborder, the Cyclorrhapha. In most of the members of this suborder there is a suture separating the lunule from that part of the head above it, the 'frontal suture'; and frequently this suture extends down on each side to near the mouth. But as the suture is wanting in several families of the Cyclorrhapha it is often difficult to determine whether the lunule is present or not." † (Comstock, 1895.)

The larva is without any distinct head.

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* It effects this by means of the ptilinum, a small bladder-like organ situated immediately above the base of the antennæ, the inflation of which by the imago springs off the upper piece or cap of the puparium. It is of course only present in the Cyclorrhapha, since the Orthorrhapha escape from the pupa-case in another manner.

† These families are the Syrphidæ, Pipunculidæ and Platypezidæ.

The suborder ORTHORRHAPHA is divided into two groups, the NEMATOCERA and the BRACHYCERA (meaning "thread-horn" and "short-horn" respectively), which are distinguished from one another by the following characters :—

NEMATOCERA, Latr.

"*Palpi pendulous*; generally 4- or 5- jointed, and more or less filiform. When (as in *Aedes* and some genera of CECIDOMYIDÆ) there are only one or two joints, the structure of the antennæ and the venation remove all doubts." (Verrall, "British Flies," 1909.)

Antennæ composed of two basal joints (which are practically always differentiated from the others and known as the scape) and *a flagellum of several joints* (at least 6, generally 8 to 16, occasionally as many as nearly 40),* *which are homologous*, that is to say, closely resembling one another.† They are most usually oval or cylindrical, not infrequently bead-like, sometimes disciform, flask-shaped, pectinate or thread-like. The antennæ of the male in many cases (CULICIDÆ, CHIRONOMIDÆ, CTENOPHORINI, etc.) differ very considerably in vestiture from those of the female.

Wings with a venation varying from a simple form (CECIDOMYIDÆ and some CHIRONOMIDÆ, etc.) to a very complex form (in most TIPULIDÆ). Anal cell (when present) wide open,‡ and with a tendency to greater width at the wing-margin; as contrasted with the BRACHYCERA, in which it is, as a rule, closed before the margin of the wing; or when open, it is nearly always narrowed towards and at the wing-margin. The 2nd longitudinal vein often furcate, the 3rd vein rarely.§ Discal cell rarely present, except in TIPULIDÆ (in which it is also not infrequently absent or capricious, according to the individual) and in the RHYPHIDÆ.

"In all cases of doubt as to whether a fly belongs to the NEMATOCERA, through the palpi being only one- or two-jointed (as in *Aedes* or some genera of CECIDOMYIDÆ), the structure of the antennæ and the venation should remove all doubt. When the antennæ are shortened, and the flagellum (=3rd joint) is apparently only annulated (as in the BIBIONIDÆ, SIMULIIDÆ and

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* Some authors dispute this, saying 28 is the highest number known.

† This term is used here in the same sense as Mr. Verrall employs it in his classificatory introduction to the second published volume (vol. v.) of his "British Flies." That is to say, in its *popular* and ordinary sense of "having the same relative position, proportion, value or structure, and not in its *zoological* sense, that the hand of a man and the fore-foot of a horse are homologues."

‡ The only exceptions occur in a few BIBIONIDÆ.

§ Williston adds, "if ever." I have in the present work temporarily recognised a certain forked vein in some genera of BIBIONIDÆ as the 3rd and not the 2nd longitudinal, although having doubts on the subject; and this prevents a statement that the 3rd vein is *never* furcate in the NEMATOCERA.

RHYPHIDÆ), then the antennæ never bear any terminal style or arista,* and the venation is either completely distinct from any of the BRACHYCERA, or, if rather similar to that of the BRACHYCERA (as in *Rhyphus*), the widened end of the anal cell determines its position, and in these cases the many-jointed pendulous palpi are distinct." (Verrall, 1909.)

"Larvæ with horizontally biting upper jaws, or with the mouthparts quite rudimentary, in which case the larvæ are peripneustic, and have 13 segments." (Brauer.)

BRACHYCERA, Macq.

"*Palpi porrect*, not pendulous; 1- or 2- jointed (sometimes rudimentary); if two-jointed, the 2nd joint is more or less clavate, and larger than the 1st, which appears to be a handle to the 2nd." (Verrall, 1909.)

Antennæ composed of two basal joints (the 1st sometimes almost imperceptible), generally differentiated from the 3rd, but in many groups, less conspicuously so than in the NEMATOCERA; and a third joint, which varies in shape, size and nature to a very great extent. In most cases it is an obviously solid joint of quite a different form from that of the basal joints (SYRPHIDÆ, MUSCIDÆ, etc.); in several groups it is, whilst differing greatly from the basal joints, *annulated*, that is, marked with fine transverse lines as though composed of several joints closely compressed (STRATIOMYIDÆ, TABANIDÆ, CŒNOMYIDÆ, etc.); in others (ASILIDÆ and some BOMBYLIIDÆ, etc.) it is elongate and cylindrical, somewhat resembling the basal joints but longer. The 3rd joint may or may not support a style or arista, the latter may be dorsal, but is more often apical. In cases where the 3rd joint is elongate and annulated also, thus bearing, to the elementary student, some resemblance to the nematocerous form of this organ, the porrect palpi, and especially the venation, will instantly remove all doubts. (Such genera are *Stratiomyia*, *Cœnomyia*, *Hexatoma*, etc.)

Wings nearly always with a venation of some complexity, but in some genera of EMPIDÆ and DOLICHOPIDÆ it is reduced to more simple form. Anal cell †, when open, always contracted near the hind margin of the wing; but more generally closed before the margin, often at a considerable distance from it. The 2nd longitudinal vein not furcate, the 3rd very often furcate.

* The only apparent exception is in the ORPHNEPHILIDÆ, an abnormal group of extremely limited extent, comprising only five known species, and not known to occur in the East. In these flies the flagellum is aristiform. In *Chionea*, a wingless Tipulid (not found in the East either), the flagellum ends in a slender 3-jointed style. For Oriental students, the rule may be considered to have no exception.

† I follow Verrall in this, but the beginner is liable to have some difficulty in recognising this cell in wings of very simple venation.

Discal cell nearly always present, but absent in some genera of EMPIDÆ, DOLICHOPIDÆ. PLATYPEZIDÆ, etc.

"In all cases of doubt as to whether a fly belongs to the BRACHYCERA or NEMATOCERA (and doubt could only arise in some STRATIOMYIDÆ and LEPTIDÆ), because of an annulated, flagellum-like 3rd joint at the antennæ (as in *Rhachicerus*, *Beris*, *Xylophagus*, *Cœnomyia*, etc.), the contraction of the anal cell towards the wing-margin provides an infallible character." (Verrall, 1909.)

"Larvæ with parallel jaws, moving upwards and downwards, or outwards and downwards, which are used for piercing, hacking, boring or sucking. Head not fully developed, only a jaw-case without ganglia present, which, however, sometimes is almost a head, because of the outwardly projecting eyes. Chain of ganglia beginning behind the jaw-case. Larvæ with rudimentary mouth-parts; meta- or amphi-pneustic, and composed of 10 to 12 segments." (Brauer.)

Tables of Families in NEMATOCERA.

1. Thorax with a conspicuous V-shaped suture on the mesonotum (indistinct but present in PTYCHOPTERINÆ). Discal cell normally present. All the veins equally distinct and complete . .	**Tipulidæ**, p. 265.
Thorax without a conspicuous V-shaped suture on the mesonotum (except in incomplete form in some BLEPHAROCERIDÆ). Discal cell always absent, except in RHYPHIDÆ . .	2.
2. Wing with seven longitudinal veins (apart from the forkings of any of these) reaching the margin of the wing. Auxiliary vein always present.	3.
Wing with less than seven longitudinal veins (apart from the forkings of any of these) reaching the margin of the wing (except in *Chironomus*, in which the auxiliary vein and 2nd longitudinal vein are always faint)	6.
3. Wings bare, never with scales or hairs. Eyes rounded. Proboscis never formed for biting; palpi incurved	4.
Wings never bare, always thickly covered with scales or hair, or both. Eyes reniform (kidney-shaped). Proboscis nearly always expressly formed for biting, or at least capable of doing so; palpi in CULICIDÆ stiff and straight.	5.
4. Discal cell always present. Head in male holoptic (eyes contiguous), or practically so. Antennæ distinctly jointed, the joints annular or oval . .	**Rhyphidæ**, p. 549.

Discal cell always absent. Head in male dichoptic (eyes separated). Antennæ filiform, the apical part indivisible into exact joints . . . . Dixidæ, p. 257.

5. Wings with scales. Legs long and slender. Proboscis always long, stiff, conspicuous, formed expressly for biting (except *Corethra*). Palpi long, stiff, prominent (except *Corethra*). . . . **Culicidæ.**

Wings with hairs (in some species also with small white spots composed of scales*). Legs short and comparatively stout. Proboscis, without being so long and conspicuous, elongate and horny in *Phlebotomus*, formed for biting, and in some Psychodinæ, though short, capable of piercing the skin. Palpi short, incurved . . . . **Psychodidæ**, p. 196.

6. Legs short and stout (about the same as in the Brachycera). Head in male holoptic. Antennæ short and comparatively stout, shorter than thorax . 7.

Legs normally long and slender (except only in *Orphnephila*). Head in male dichoptic (except in one or two genera of Mycetophilidæ). Antennæ long and slender (except in *Orphnephila*), often longer than the head and thorax taken together . . . . 8.

7. The 2nd basal cell and the posterior cross-vein present. All veins distinct (Bibioninæ).† Wings normally broad, costal vein extending round the margin of the wing. Ocelli present. Antennæ short and stout . . . . **Bibionidæ**, p. 157.

The 2nd basal cell always present; posterior cross-vein always absent. Auxiliary, 1st and 3rd longitudinal veins thickened, the rest generally faint. Wing distinctly broader than usual. Costal vein ending at tip of wing. Ocelli absent. Antennæ long, slender, typically nematocerous. . . . . . **Simuliidæ**, p. 182.

8. Antennæ apparently of three joints, terminating in a bristle. Wing with two basal cells. Legs comparatively short . . . . **Orphnephilidæ** (not Oriental).

Antennæ normally nematocerous. Wing with only one basal cell (except in one or two genera of Blepharoceridæ). Legs long and slender . . 9.

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* In a few species the wing itself is more or less covered with small scales, in addition to or irrespective of such spots.

† When the 2nd basal cell and the posterior cross-vein are absent, the longitudinal veins are always very indistinct (Scatopsinæ).

9. Wing with a secondary venation, forming a spider-web-like network, in addition to the primary characteristic normal venation. (Thorax with an incomplete suture) .... **Blepharoceridæ**, p. 148.
   Wing without such secondary network venation .... 10.

10. Costal vein ending at tip of wing, not carried round posterior margin ...... 11.
   Costal vein continued around the whole margin of the wing .... **Cecidomyidæ.**

11. Tibiæ without spurs; coxæ never conspicuously enlarged. Anterior cross-vein, when present, transverse as usual .... **Chironomidæ.**
   Tibiæ always with spurs; coxæ greatly and conspicuously developed (MYCETOPHILINÆ), or, if normal, then the anterior cross-vein placed longitudinally (SCIARINÆ).............. **Mycetophilidæ**, p. 44.

MYCETOPHILIDÆ.

The MYCETOPHILIDÆ are a rather well-defined family, distributed throughout the world from the arctic regions to the tropics, but

Fig. 7.—*Mycetophila.*

most numerous in temperate climates and altitudes of four or five thousand feet upwards in warmer regions. They are delicate in structure and comparatively small or very small in size, for the greater part obscure in colour, blackish, brownish or yellowish, rarely with really vivid colours, but often with paler markings.

In the typical subfamily the principal genus, *Mycetophila*, with some others, possesses a laterally compressed abdomen, which, with the hump-shaped thorax and low small head, gives them the appearance of fleas, the resemblance being further heightened by the power of leaping to some extent by means of the well-developed hind legs.

There are no macrochætæ in the family, the majority of the species being almost devoid of all but a microscopic pubescence and a few bristly hairs on certain parts of the body. The tibiæ, however, are in most cases (except SCIARINÆ) furnished with two or three rows of bristles, which afford good characters for classification, and also with apical spurs. The coxæ are more or less enlarged, often very considerably so, in all the subfamilies except SCIARINÆ, in which they are nearly normal.

The imagos are found in shady places in fields and woods, the larval stages being passed in fungi in a large number of the species, in rotten wood in many others, whilst a limited number are aquatic. A few species live in vegetable mould, under the bark of trees or in cow dung, and many occur in marshy places.

About four hundred extinct species are known, a good number of these belonging to the more extensive recent genera, though they appear geologically as early as the Mesozoic period, in the Purbeck beds.

Popularly they are known as fungus-gnats, from their breeding in fungi, and it has been claimed that their presence is of economic value to the farmer by keeping down the fungi which would otherwise by their numbers injure trees and shrubs.

Some species are said to hibernate and reappear in early spring when, according to Heeger, they "copulate after a few days, generally in the evening. After six or ten days, the female, if the weather is moist and rainy, lays its eggs on the fungi growing on old horse-chesnuts, singly, twenty or thirty on the same fungus. The larvæ hatch after eight or ten days."

The family characters of the adult Mycetophilid may be briefly summarised as follows:—

Head small, rounded or moderately elongate; eyes rounded or sometimes reniform, separated in both sexes by a broad frons. Ocelli two or three; when only two, they are placed each touching an eye-margin; when three, they may be in the form of a more or less flattened triangle, or practically in a straight line, but the middle one is always on the centre line of the frons. Antennæ elongate, of 12 to 16 joints; the scapal or two basal joints differentiated, the rest generally cylindrical, in some genera compressed, more rarely pectinate. Proboscis short, blunt; quite elongate in one or two genera only (*Gnoriste* is the only Oriental genus). Palpi of three or four joints, incurved, the 1st very small, occasionally one joint much more strongly developed than the others.

Thorax moderately arched, in a few cases conspicuously so; scutellum comparatively small, metanotum prominent.

Abdomen elongate and generally cylindrical in the male, pointed in the female, often laterally compressed in both sexes; normally 6- or 7-jointed; often contracted at the base. The male genitalia are complex and prominent, variable in structure, but less so than in the TIPULIDÆ; the female ovipositor short, not prominent, with two terminal lamellæ.

Legs long, slender and delicate, with the coxæ as a rule distinctly enlarged and elongate in all the subfamilies except SCIARINÆ, in which they are more nearly normal. Tibiæ with spurs at the tips, and often with two or three rows of bristles affording good classificatory characters; femora in some groups more or less flattened and widened.

Wings comparatively broad, oval or slightly elongate, humeral cross-vein nearly always present, subcostal cross-vein rarely; auxiliary (or "subcostal") generally short, rarely extending beyond middle of wing; 1st longitudinal long, the 2nd longitudinal absent, the 3rd emerging from the 1st generally about its middle and ending a little before the wing-tip usually at the spot or very near where the costal vein terminates. The 3rd vein often forked, the upper branch often short and so obliquely placed as to appear as a cross-vein (especially in *Macrocera* and SCIOPHILINÆ, in the latter enclosing an additional cell, by cutting off the basal portion of the marginal cell).* The 3rd vein in two groups is coalescent with the 4th for a short distance (MACROCERINÆ, CEROPLATINÆ); the 4th longitudinal is always forked, at varying distances from the base, the 5th also; in both these veins, one or both the branches may be indistinct on the basal portion. Posterior cross-vein present or absent, in the latter case its absence being due to the coalescence (sometimes only punctiform or nearly so) of the 4th and 5th veins. Marginal cross-vein absent; † discal cell always absent; 6th and 7th longitudinal veins more or less incomplete or indistinct in most genera, in a few well developed, often one or the other rudimentary or absent. One genus in this family is wingless.‡ In the SCIARINÆ the auxiliary vein is always straight and ending free, never united either to the costa or the 1st longitudinal vein; the 1st is moderately long, the 3rd begins at a right angle, and the anterior cross-vein is so oblique, and as a rule long, as to appear in a line with that portion of it after the bend. The 4th vein is forked at

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* Being bounded by the 3rd longitudinal vein, instead of the 2nd, this cell is technically perhaps the submarginal. I propose the name "Sciophiline cell" for it, as characteristic of this subfamily.

† The only doubtful case is *Allactoneura*, Meij., *q. v.*

‡ *Epidapus*, a non-Oriental genus. Winnertz says that *E. venaticus*, Hal., found in Europe, breeds in the rotting stems of *Carpinus betulæ* in company with some species of *Campylomyza* (CECIDOMYIDÆ). *E. scabiei*, Hopkins, according to its author, is the cause of some disease in the potato, forming a kind of scab.

varying distances from the base according to the species, and perhaps too much importance has been placed on this as a character in classification. The 5th vein is widely forked at the base, the upper branch sometimes detached; 6th incomplete; 7th rudimentary or absent.

Life-history.—The metamorphoses of a good many species, mostly European, are known, but no Oriental species has yet been studied in the earlier stages.

The eggs are laid singly on the underside of a leaf, or on the pileus of a fungus, but in the case of *Sciara* they may frequently be joined together end to end in a long string, and I have often met with specimens of this genus with such a string of eggs still attached to the abdomen, from which by slight pressure further eggs could be made to extrude.

The larva itself has generally the appearance of a very elongate, sub-cylindrical, semi-transparent, worm-like maggot, of twelve segments, with a distinct but small head, and yellowish or dirty white in colour. Osten Sacken's description of the larva of *Mycetophila* may be drawn upon here.

"A distinct horny head; a fleshy labrum, encased in a horny frame; horny flat lamelliform mandibles, indented on the inside; maxillæ with a large coriaceous inner lobe and a horny outside piece, with a circular excision at the tip; labium horny, small and almost rudimentary; body fleshy, with eight pairs of stigmata." One pair of stigmata is on the first thoracic segment, the remaining seven on the first seven abdominal segments.

The larva possesses antennæ, which in most genera are more or less rudimentary, but in some (*Bolitophila*, for example, a non-Oriental genus) they are distinctly jointed. In some genera ocelli are present. The means of progression are furnished by rows of short bristles on the under surface. Most of the larvæ are peripneustic.*

Some species spin true cocoons when preparing to pupate, whilst others construct a rude pupa-case from earthy materials. Occasionally (*Epicypta*, a European genus) the larval skin is adapted to form a cocoon in which to pupate, but the pupa itself is free. It is smooth, with more rounded corners than in the TIPULIDÆ, the legs and antennæ being generally distinctly recognisable.

Geographical Distribution.—World-wide, from the Arctic Circle to the tropics in both hemispheres, but most abundant in temperate regions.

In comparing the MYCETOPHILIDÆ as a family with the other families of NEMATOCERA, it may be remembered that although the SCIARINÆ are usually ranked as a subfamily only of an equal

* In at least one non-Oriental species, *Mycetobia pallipes*, Mg., from Britain and North Europe, the larva is amphipneustic, that is, it has a pair of stigmata at the tail-end and a pair on the first thoracic segment.

value with the other subfamilies, they possess two tolerably consistent characters that separate them from these other families taken together; so that many authors regard this family as divided into two parts, the Mycetophilid part and the Sciarid part, the former divisible into several well marked subfamilies, the latter practically represented by the gigantic genus *Sciara* alone.

The Mycetophilids, taken in bulk, are nearly always recognisable from the rest of the NEMATOCERA by their much enlarged coxæ, whilst the Sciarids, wanting this particular characteristic, may be recognised by their reduced venation, in conjunction with the abnormal obliquity of the anterior cross-vein, which is so parallel to the longitudinal axis of the wing as to appear nearly always as the basal portion of the 3rd longitudinal vein. They can hardly be mistaken for any other group except some CECIDOMYIDÆ, but an absolute beginner might confuse them with a small *Plecia*, and from this the long slender antennæ would at once distinguish them.

In the generic descriptions Johannsen (Gen. Ins., Fasc. 93, 1909) has been largely relied on, as the latest cosmopolitan worker in this group, and his characters have been accepted and generally copied *verbatim*, except that the descriptions of the venation are my own, in order that the terminology may be consistent with that of the remainder of the present work.

Table of Subfamilies.

1. Coxæ moderately long; anterior cross-vein nearly in a line with the longitudinal axis of the wing. The 5th longitudinal vein forked near base of wing	SCIARINÆ, p. 119
Coxæ conspicuously elongated; anterior cross-vein nearly always sufficiently transverse to occupy generally its normal position............................	2.
2. The 4th longitudinal vein arises from the 5th near base of wing; 6th vein more or less indistinct	3.
The 4th longitudinal vein arises opposite or beyond the origin of the 3rd vein; 6th vein generally distinct	4.
3. The 3rd longitudinal vein forked; its anterior branch usually so near its origin and so transverse that it resembles an additional cross-vein. Three ocelli present	SCIOPHILINÆ, p. 68.
The 3rd longitudinal vein not forked	MYCETOPHILINÆ, [p. 80.
4. The 3rd vein not forked	DIADOCIDIINÆ.*
The 3rd vein forked	5.

* Although no species of DIADOCIDIINÆ, MYCETOBIINÆ or BOLITOPHILINÆ has been found in the East, it seems eminently desirable in the present unsatisfactory state of our knowledge of this family to include in the table all the recognised subfamilies, since it is probable that one or all of them really exist in that region.

5. Anterior branch of 3rd vein very long, ending in costa .... MYCETOBIINÆ.
   Anterior branch of 3rd vein short, more transverse, ending usually in 1st longitudinal vein .... 6.
6. Præfurca of 4th vein arising from 3rd vein beyond the anterior cross-vein, *i. e.*, the cross-vein is really wanting, and the 3rd and 4th longitudinal veins are coalescent for a short distance.................... 7.
   The 4th vein continuous in nearly the same line from its origin from the 5th to the fork; anterior cross-vein distinct .... BOLITOPHILINÆ.
7. Antennæ short and thick-set, often flattened. CEROPLATINÆ, p. 55.
   Antennæ very long and slender, longer than the body .... MACROCERINÆ, p. 49.

Subfamily MACROCERINÆ.

This subfamily consists of only one known genus, *Macrocera*, which is rather easily recognised by the very long antennæ (longer than the body), the superior size of most of the species, the generally conspicuously marked wings, and the coalescence of a portion of the 3rd and 4th longitudinal veins.

Genus **MACROCERA**, *Mg.*

Macrocera, Meigen, Illig. Mag. ii, p. 261 (1803).
Geneja, Lioy, Atti Istit. Veneto (3), ix, p. 229 (1863).
? *Macroura*, Berendt, Organ. Reste Bernstein, i, p. 51 (1845), *nom. nud.*

GENOTYPE, "*Tipula longicornis*," Mg. (1803), according to some, but the identification seems doubtful. Curtis named *M. lutea* as type (British Entomology, p. 637, 1837).

Head broad, oval, flattened in front; eyes oval, slightly emarginate at the base of the antennæ; ocelli three, of unequal size, placed in a flattened triangle on the front, the anterior one smaller. Palpi four-jointed, cylindrical, the 1st joint small, the following subequal, or the last one longest; antennæ 16-jointed, very long, often much longer than the body, arcuate, projecting forward, the 1st scapal joint spheroidal, the 2nd cupuliform, the basal flagellar joints cylindrical, the others filiform, hairy, on the lower side somewhat setulose, the last two joints densely covered with longer hairs and setæ. *Thorax* oval, highly arched; scutellum small, nearly semi-circular; metanotum highly arched. *Abdomen* depressed, nearly cylindrical, in the female widest at the middle, in both sexes with seven segments. The genitalia in *Macrocera*, at least so far as Oriental species go, are rather consistent. A dorsal plate, oblong (bilobed or not) or narrowed, a pair of large, rather compressed fleshy

claspers, the 1st joint obtusely conical, the 2nd more or less similar but more elongate, ending in a pair of short stout black claws; both joints with rather copious long hairs. A small inner pair of appendages can also be seen. *Legs* slender and long, the fore pair much shorter; tibiæ with minute spurs; tibial setæ apparently wanting. *Wings* hairy or microscopically setulose, large, broad, with a very broad base, usually longer than the abdomen, half open when at rest. Costa produced nearly to the tip of the wing; auxiliary vein short, ending at or before one-third of the wing; subcostal cross-vein absent.* The 1st longitudinal vein long, ending about the middle of the wing; the 3rd strongly bisinuate, forked near the tip, the upper branch short, placed usually at an angle of about 45° and joining the costa; the 3rd vein coalesces with the 4th for some distance at the point where the anterior cross-vein usually occurs, this latter vein being absent, but in at least one species (*M. elegans*), the contact is almost punctiform. The 4th longitudinal vein takes a sudden and angular turn upwards just before coalescing with the 3rd and forks very soon beyond the coalescence, the prongs slightly diverging. The 5th vein forks early and rather abruptly, the upper branch turning downwards again at the point where it coalesces punctiformly with the 4th longitudinal, the posterior cross-vein thus being entirely absent. The 6th vein is comparatively close to and more or less parallel with the hinder branch of the 5th, the anterior branch of which is generally rather irregular in outline, though in its entirety forming a gentle curve. The 7th vein incomplete, often indistinct.

Range. Europe, the Orient, Australasia, North and South America and the West Indies.

Life-history.—Such of the European species as have been studied, breed in the rotting stems of *Carpinus betulus*, but one species, *M. limbata*, Winn., also from Europe, is said to breed in *Dædalia quercina*. The perfect insects exhibit a predilection for nettles, but may occur in any shady, woody spots.

Macroura, Berendt, may be a misprint for *Macrocera*. *Euphrosyne*, Mg. (1800), is not admissible. *Macrocera* is somewhat easily recognized by its superior size, very long slender antennæ, the generally present conspicuous wing markings, and the coalesced portions of the 3rd and 4th longitudinal veins.

Table of Species.

1.	Wing with distinct markings	2.
	Wing entirely devoid of markings	6.
2.	A very large dark brown round spot filling nearly all the apical half of the wing	*ornata*, sp. n., p. 51.
	No such mark	3.

* Johannsen (Gen. Ins.) says it is present, but I do not find it, and it is not shown in that author's figure of the genus.

3.	Costal border very distinctly yellow	4.
	Costal border without yellow markings ..	5.
4.	Costal dark spots three in number, squarish and well-defined	*alternata*, sp. n., p. 52.
	Costal marks ill-defined	*flavicosta*, sp. n., p. 53.
5.	All the tip of the wing palely infuscated; a brownish streak from costa to middle of wing, and a smaller brownish streak before it. Thorax all blackish	*brunnea*, sp. n., p. 53.
	Only a small infuscated spot at wing-tip, barely reaching beyond upper branch of 4th vein; the brown mark in the middle of the wing much darker, and more clearly cut. Thorax yellowish, with three blackish stripes	*elegans*, sp. n., p. 54.
6.	Species with blackish thorax and brownish yellow abdomen and legs	*inconspicua*, sp. n., p. 54.
	Species with reddish yellow or ferruginous thorax and abdomen	*ferruginea*, sp. n., p. 55.

1. **Macrocera ornata**, sp. nov. (Pl I, fig. 1; Pl. III, fig. 1.)

♂ ♀. *Head* brownish yellow, darker behind in male; lighter behind in female, vertex, epistoma and face darker brown; palpi yellow; antennæ (except 1st joint, which is yellow) missing. *Thorax*: dorsum shining black, with a few short hairs on shoulders, posterior corners and scutellum; traces of a pair of outwardly curved, well separated rows of microscopic bristly hairs. Sides of thorax shining black in male, very dark shining brown (almost black) in female, also scutellum and metanotum; a little yellow around the thoracic stigma. *Abdomen* wholly shining black, very shortly pubescent. Genitalia very large and conspicuous; a narrow bilobed dorsal plate; a pair of large thick prominent claspers, the second joint nearly as long but not so thick as the first, and terminated by a pair of short stout black claws; an inner pair of small lamellæ. The whole organ brownish yellow with somewhat copious black hairs. In the female normal, inconspicuous. *Legs* with coxæ and femora yellow, tibiæ and tarsi brownish yellow in male, darker brown in female; legs minutely pubescent. *Wings* pale grey; costal border, marginal cell, upper part of basal cell and basal half of 5th posterior cell rather bright yellow; a large dark brown oval spot occupying the greater part of the distal half of the wing, touching the costa but clear of the hind margin; a very minute brown speck at absolute tip of wing; two narrow, dark brown streaks, placed diagonally, the 1st commencing on the 3rd longitudinal vein (a little before the bifurcation of the 4th), running to the inner hind margin, and crossing the 5th posterior and anal cells along their centres; the 2nd streak runs from the upper branch of the 5th longitudinal (close to the large brown

spot) to the tip of the anal vein on the wing-margin. Halteres dirty yellow, clubs brownish.

Length ♂ 6½, ♀ 8 millim.

Described from two males and a female in the Indian Museum collection, the former taken by me at Darjiling, 28. v. 10, and the female from Kurseong, 15. viii. 09, taken by Dr. Jenkins.

The antennæ of the female were present when the specimen first reached the Museum, and a note was made that they were very long and thin and 12- to 14-jointed.

2. **Macrocera alternata**, sp. nov. (Pl. I, fig. 2.)

♂ ♀. *Head* nut-brown yellow. Antennæ with the two small basal joints forming the scape brownish yellow, also the basal half of 1st joint of flagellum, the apical half being black; remaining joints of flagellum each with basal half black and apical half white. *Thorax* light chestnut-brown; dorsum dusted with yellowish grey, with three broad, not very well defined, elevated, rather darker brown stripes arranged in the pattern common to this family and the TIPULIDÆ. Scutellum and metanotum concolorous. *Abdomen* of male brownish yellow, with short black fine pubescence, posterior margins of segment black or blackish, the colour extending to the posterior half of the 2nd and 3rd segments; tip of abdomen blackish; belly mainly similar to upperside. Genitalia large and conspicuous, consisting of a rather large oblong dorsal plate, a pair of elongated, fleshy, brown and black, two-jointed hairy claspers (the second joint nearly as long and large as the first), each with a pair of strong short black tooth-like claws at tip; also a small inner pair of lamellæ. Abdomen of female larger and broader, light brownish yellow, with a roughened appearance, only the posterior corners of the segment broadly dark brown, the colour extending well over the sides; genitalia small, brown. *Legs* yellowish, minutely pubescent, darker at tips. *Wings* pale grey; costal border, marginal and 1st basal cells yellow; humeral cross-vein with a brown suffusion, and there are also brown suffusions (mostly rather well marked) placed as follows:—a squarish spot over tip of auxiliary vein, a similar one over tip of 1st longitudinal, and another over tip of upper branch of 3rd longitudinal; an elongated suffusion over tip of lower branch of 3rd longitudinal, and a larger irregularly oval spot over the bifurcation of the 4th vein, enclosing the unification of 3rd and 4th veins and extending posteriorly, gradually fading away along the 5th vein; base of 3rd vein with a small roundish spot; tips of veins almost imperceptibly clouded at the wing-border. Halteres dirty yellow.

Length ♂ 6, ♀ 9 millim.

Described from a single male (*type*) in the Indian Museum collection from Naini Tal, 6000 ft., United Provinces, 10. vi. 09, and a type female in my own collection taken by me at Mussoori, June, 1909.

The example representing what I take to be the female of this species agrees with the male in every way except in the abdomen and its greater size.

3. **Macrocera flavicosta**, sp. nov. (Pl. I, fig. 3.)

♀. *Head* blackish, except pale proboscis and palpi. Antennæ missing, except scapal (yellowish) joints. Eyes with short white pubescence. *Thorax* (slightly damaged), brownish yellow, with two lateral broad black stripes not reaching the shoulders, and three median narrower ones attaining the front margin. Scutellum and metanotum brown, the former with bristles on the hind border. Sides of thorax yellowish, including humeri, pleuræ brown, moderately shining. Various short bristles on the thorax and four or five strong post-alar ones. *Abdomen* black, hind borders of each segment with a narrow yellow band; genitalia small, black. *Legs* with the coxæ and femora yellowish, tibiæ and tarsi dark brown. *Wings* pale grey, hind border and along the veins here and there very faintly darker; anterior part from costa to behind the 3rd vein yellow, with ill-defined brown marks as follows:— at base on tbe costa; a larger one from the costa up to and including the fork of the 4th vein; smaller ones over fork of 3rd vein and at tip of wing; also a narrow brown line along the hinder margin of the yellow part; also between 5th and 6th veins just below coalescence of 3rd and 4th, and along the greater part of 6th vein. Halteres brownish yellow.

Length 6½ millim.

Described from one example in my collection, without exact data, but certainly captured by me in the East, most probably in India. In good condition except for the missing antennæ and the little damage done to the thorax by the pin.

4. **Macrocera brunnea**, sp. nov. (Pl. I, fig. 5.)

♀. *Head* brownish yellow, mouth-parts, palpi and vertex darker. Scape yellow, flagellum very dark brown. *Thorax*: dorsum dark brown, with the three usual stripes darker still and more shining, leaving the shoulders pale yellow, the median stripe attaining the fore border of the thorax. Sides of thorax yellowish; pteropleura, sternopleura, and metapleura dark shining brown. Scutellum yellow, dorsum brown; metanotum dark shining brown. *Abdomen* dark brown, moderately shining, lightly pubescent, a little paler towards hind margins (in the type, distinctly and rather broadly yellow on 2nd and 3rd segments). A yellow streak along sides of abdomen; belly dark brown, pubescent. *Legs*: coxæ yellow, fore pair with a brownish streak in front, posterior coxæ more or less brown on outer side; all femora with a row of hairs on underside, in addition to the minute pubescence on all the legs. Femora and tibiæ (except fore femora and major part of fore tibiæ, which are all yellowish) dark brown. *Wings* pale grey, indistinctly clouded at tip; an irregular

dark brown suffusion across the centre of the wing, including the cross-veins, commencing just below the costa and attaining the middle of the wing; a second brownish suffusion over the upper corner of the basal cell. Halteres pale yellow, clubs brown.

Length 5–6½ millim.

Described from two specimens in the Indian Museum from Phagu, 9000 ft., Simla district, 12. v. 09 (*Dr. Annandale*).

5. **Macrocera elegans**, sp. nov. (Pl. I, fig. 4.)

♂. *Head* brownish yellow; the three ocelli placed on the frontal tip (which is black) of the longitudinal elongated convexity on the vertex. Palpi a little brown. Antennal scape yellow, flagellum dirty yellow. *Thorax* brownish yellow; three blackish brown stripes of the ordinary pattern, the outer ones shorter; a small blackish streak on each side in front of the wing. Scutellum and metanotum brownish, edges of former a little yellow. Sides of thorax yellowish. *Abdomen* brownish yellow, with black hair, hind margins of segments blackish; belly similar. Genitalia rather large, yellow, pubescent, 1st joint robust, elongate oval, 2nd elongate but narrower, with a pair of small black claws at the tip. *Legs* yellowish, tibiæ and tarsi dirty yellow. *Wings* nearly clear; a blackish, zigzag, rather narrow, transverse band, widest in the middle, across the middle of the wing from the costa to the anterior branch of the 5th longitudinal vein; a blackish apical spot reaches from the costa to just beyond the tip of the anterior branch of the 3rd vein. Halteres yellowish.

Length 5 millim.

Described from one male taken by me at Darjiling, 26. v. 10, on the hillside, amongst herbage.

Type in the Indian Museum.

6. **Macrocera inconspicua**, sp. nov.

♂. *Head* brownish yellow; antennæ lighter, a little paler still at the joints; palpi brown. Vertex flattened, darker, back of head dark grey. *Thorax* brownish yellow; dorsum with three wide, shining, but not very conspicuous, rather darker, chesnut-brown stripes, occupying nearly all the surface except the shoulders, which are yellowish. Pleuræ shining brown. A minute row of stiff hairs on each side of the median line, and on the sides of the dorsum; a pair of long dorso-central bristly hairs, well separated, on posterior border, and two similar ones on each posterior corner. Scutellum and metanotum concolorous, the former with a row of ten stiff hairs, of which the four middle ones are much the longest. *Abdomen*: first segment yellowish, remainder brown, with black posterior margins, the whole abdomen with rather long black hairs. Genitalia conspicuous, dark brown and yellowish, consisting of a large dorsal oblong plate, and the normal pair of large two-jointed claspers,

terminating in a pair of black claws at tip. There is a pair of small inner organs, not easily visible. Whole genitalia with long stiff black hairs. *Legs* brownish yellow, tarsi blackish; femora with a row of short hairs below; legs minutely pubescent. *Wings* pale yellowish grey, veins yellow; halteres brownish.

Length 5 millim.

Described from a single male in the Indian Museum from Kaladhungi, Naini Tal district, Kumaon, 28. v. 09.

7. **Macrocera ferruginea**, sp. nov.

♀. *Head* wholly reddish yellow, except the brown proboscis and black vertex. Face rather produced, with a fan-shaped row of seven or eight long slender bristles just below the antennæ, which latter are reddish yellow, rather closely pubescent. *Thorax* light ferruginous brown, moderately shining, shoulders more yellowish. A dorsal, black, distinct but not clearly defined stripe, and traces of one on each lateral margin, on which are a few bristly hairs. *Abdomen* light brown, lightly pubescent, posterior borders of segments very narrowly darker; belly concolorous, a little lighter or darker here and there. Genitalia inconspicuous, very narrow, pale yellow. *Legs* pale brownish yellow, tarsi a little darker. *Wings* clear yellowish grey; halteres reddish yellow.

Length 5 millim.

Described from a single female in the Indian Museum from Bhim Tal, Kumaon, 4500 ft., 22–27. ix. 06 (*Annandale*).

Subfamily CEROPLATINÆ.

The principal character of this subfamily is the somewhat shortened and thickened, and generally flattened nature of the antennæ, which are in some cases composed of rather closely compressed disc-like joints, resembling flat beads on a string. The absence of the anterior cross-vein, owing to the coalescence of a portion of both the 3rd and 4th longitudinal veins, is a subfamily character, in which it resembles the MACROCERINÆ, which latter, however, are very easily distinguished from it by their very long graceful slender antennæ, always longer than the whole body.

This subfamily is probably distributed throughout the world.

Table of Genera.

Veins in hinder part of wing less distinct than those in anterior half.	
Palpi porrect	CEROPLATUS, Bosc, p. 56.
Palpi incurved..................	PLATYURA, Mg., p. 58.
All the veins very strong and distinct . .	ISONEUROMYIA, gen. nov., [p. 66.

Genus CEROPLATUS, *Bosc.*

Ceroplatus, Bosc, Act. Soc. Hist. Nat. Paris, i, 1, p. 42 (1792).
Cerotelion, Rondani, Dipt. Ital. Prod. i, p. 191 (1856).

GENOTYPE : Rondani designated *Platyura laticornis*, Mg., as the type species. This is now considered synonymous with *Cerotelion* (*Tipula*) *lineatus*, F.

Head small, broadly ovate, flattened in front; eyes oval, sometimes emarginate at base of antennæ. Three ocelli arranged in a transverse curved line in front. Palpi short, not incurved, three or four-jointed, the 1st joint very small, the following longer, differing with the species. Antennæ projecting forward, shorter than head and thorax together, very broad and flat, compressed, strap-like, 16-jointed, basal joints short, apical joint conical or bud-like, the intermediate ones much broader than long. *Thorax* ovate, highly arched; scutellum nearly semicircular, metanotum arched. *Abdomen* of seven segments, cylindrical or somewhat depressed. *Legs* long, the tibiæ with spurs of unequal length, lateral tibial setæ absent or very minute. *Wings* microscopically setulose, shorter than the abdomen, with the base broadly rounded, decumbent. Costa produced beyond lower branch of 3rd vein; auxiliary vein long, ending at about the middle of the wing, subcostal cross-vein quite near base of auxiliary vein; 1st longitudinal vein long and straight; 3rd longitudinal originating in a wide sweep, bisinuate, the anterior branch very short, upright, united to the 1st longitudinal vein near its tip (*Ceroplatus* s. s.) or to the costa just beyond the tip of the 1st longitudinal (*Cerotelion*, Rond.). The 4th vein forks soon after quitting the coalesced portion of the 3rd and 4th veins, the branches gently divergent; posterior cross-vein normal in length and position, 5th longitudinal widely forked immediately before meeting the anterior cross-vein; 6th vein long, reaching border of wing, 7th very short and indistinct.

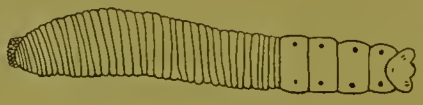

Fig. 8.—Larva of *Ceroplatus.*

Life-history.—The larvæ live on the underside of tree-fungi protected by the webs that they spin. *Ceroplatus sesioides*, a European species, is said by Wahlberg to live on *Polyporus betulæ*, and this author states that both the larva and pupa of this species emit a phosphorescent light, whilst the larva of *C. mastersi*, of Australia, is also luminous.

Range. Europe, Australasia, North and South America; now recorded from the East for the first time. Johannsen separates *Cerotelion* from *Ceroplatus*; in the Kertész Catalogue they are united under the latter name.

8. **Ceroplatus quadripunctatus**, sp. nov. (Pl. I, fig. 6; Pl. III, fig. 2.)

♀. *Head* blackish; eyes separated below the antennæ by a narrow grey line; mouth-parts yellow; antennal scape dirty yellowish white, flagellum black, the joints much broader than long, with the apical two or three joints dirty white. *Thorax* dull yellow. Dorsum with an indistinct thin reddish line, slightly enlarged on the anterior margin. On each side of this line are two, much shorter, narrow, well separated, distinct brown stripes, joined in front by a narrow cross-stripe, which latter is placed at some distance from the anterior margin. These four stripes almost meet in the middle of the hind margin, where each outer stripe is enlarged into a triangle placed nearly on the posterior corner of the dorsum. The space on each side of the posterior half of the median line, as far as the nearest stripe on each side, is darker brown. Below the posterior corners of the dorsum is a thin brown streak. Sides of thorax, the scutellum and metanotum, pale yellowish white. *Abdomen* dirty yellow, 1st segment and tip of abdomen brownish. Belly concolorous, lighter, the middle segments with a very slightly darker median stripe on the basal half, joined to a wavy transverse line across the centre of the segments; abdomen with short black pubescence. Genitalia yellowish white, inconspicuous. *Legs* yellowish white, tips of posterior coxæ and bases of posterior femora, brownish, also tips of tibiæ; tarsi rather darker dirty yellow. *Wings* moderately dark grey, darker at tip and on distal part of hind border. Two broad, blackish, distinct stripes (ill-defined at the edges) run from the costa; the outer edge of the first placed just before the middle of the wing, the stripe filling the basal third of the marginal cell, but not encroaching on the basal cell; the second blackish stripe begins on the costa, immediately beyond the middle of the wing, and is wide enough to enclose the upper branch of the 3rd vein, extending posteriorly to the middle of the 1st posterior cell, where it joins the apical darkening of the wing, thus enclosing, on the costal border, a roundish clear spot, through the centre of which runs the 3rd vein; between the two dark stripes the wing on the costal border is nearly clear for an irregularly square space, ill-defined at the edges, thus giving the appearance of two distinct clear spots on the costal border of each wing. Veins brown, anterior ones, including the 3rd, deeper and stronger. Halteres pale yellow, clubs brown.

Length $4\frac{1}{2}$ millim.

Described from one specimen in the Indian Museum, from Calcutta, 27. vii. 09, where Dr. Annandale took it from a spider's web.

If *Cerotelion*, Rond., is admitted as generically distinct from *Ceroplatus*, the present species will belong to it.

Genus PLATYURA, *Mg.*

Platyura, Meigen, Illig. Mag. ii, p. 264 (1803).
Orfelia, A. Costa, Il Giambatt. Vico. ii, p. 448 (1857).

Genotype : Meigen specified no particular species as the generic type. Zetterstedt designated *P. fasciata*, Mg.*

Head small, transversely oval, flattened in front; eyes oval, slightly emarginate at the base of the antennæ; ocelli three, unequal, closely approximated in a flat triangle on the broad front, the median ocellus smallest. Palpi incurved, four-jointed, the 1st joint small, the 2nd oval, equal or shorter than the 3rd, the 3rd and 4th cylindrical, the 4th longest. Antennæ equal to or longer than the head and thorax taken together, rarely shorter, arcuate, projecting forward, cylindrical or rather compressed, somewhat diminishing in diameter towards the apex, 16-jointed, the scapal joints differentiated, the 1st cupuliform, the 2nd more cyathiform, the flagellar joints closely sessile. *Thorax* oval, highly arched; scutellum small, nearly semicircular in outline; metathorax arched. *Abdomen* slender, in both sexes seven-segmented, depressed, clavate, in the male somewhat cylindrical at the base, rarely wholly cylindrical, ending in a forceps. *Legs* long, the femora somewhat thickened, shorter than the tibiæ, the tibiæ spurred, with very minute setæ, one row on the inner side and two rows on the outer, or the fore pair wholly without. *Wings* broad, with rounded base, as long as or a little longer than the abdomen, decumbent, microscopically setulose. Costa ends before tip of wing, subcostal cross-vein present, placed half way between the humeral cross-vein and tip of auxiliary veins, joining the latter to the 1st longitudinal. Auxiliary vein generally very short, the 1st longitudinal ending about the middle of the wing or a little beyond; the 3rd longitudinal begins at one-third or one-fourth of the wing, distinctly curved on its basal part, thence nearly straight or gently curved, its upper branch very short, oblique, and joined either to the 1st vein near its tip or to the costa; the 3rd and 4th veins coalescent for a short period, the anterior cross-vein being absent; the 4th vein forked at various points according to the species, but before half the length after quitting the coalescent portion; the 5th vein forked just before the posterior cross-vein which is always placed at the proximal end of the coalesced veins; the 6th vein very long, nearly or quite reaching the wing border, nearly straight, and sometimes more or less indistinct; the 7th vein short and indistinct.

Range. Probably world-wide, though none appears to have been recorded from Africa, and only one (*venusta*) from Asia.

Life-history.—The larvæ live in fungi and rotten wood, but beyond this fact little seems to be known.

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* Dipt. Scand. x, p. 4077 (1851).

Johannsen says a subcostal cross-vein is usually present and illustrates it in one of his two figures (Gen. Ins. pl. iii, fig. 15) of the genus, but it does not seem to be present in the species examined by me; it may, however, easily be overlooked.

Zelmira, Mg.[2] (1800), is inadmissible, having been instituted without a species.

Table of Species.

1.	Wing with more or less suffused tip, or else at least the veins distinctly suffused ..	2.
	Wing clear grey or pale yellowish grey ..	8.
2.	Reddish brown species; very yellowish wing with brown tip	*grandis*, sp. n., p. 60.
	Blackish or yellowish species	3.
3.	Wing-tip distinctly suffused	4.
	Wing-tip not distinctly suffused, but the principal veins suffused with dark brown	*suffusinervis*, sp. n., [p. 60.
4.	Extreme tip of wing nearly clear	5.
	Extreme tip of wing equally suffused	6.
5.	Thorax wholly unicolorous	*apicipennis*, sp. n., [p. 61.
	Thorax with three blackish stripes	*affinis*, sp. n., p. 62.
6.	Thorax brownish with three darker stripes .	7.
	Thorax blackish, with a yellowish median stripe	*flaviventris*, sp. n., p. 62.
7.	Thorax lighter brown, with three dark stripes, shoulders not conspicuously paler	*marginata*, sp. n., p. 62.
	Thorax darker brown, with still darker stripes, shoulders conspicuously pale yellowish	*vicina*, sp. n.,* p. 63.
8.	Abdomen with only two bands, which are white	*venusta*, Wlk., p. 63.
	Abdomen with three or more yellowish bands	9.
9.	Abdomen eight-segmented	*octosegmentata*, sp. n., [p. 64.
	Abdomen seven-segmented as usual	10.
10.	Thorax reddish yellow, with or without three dark stripes, sometimes nearly filling the dorsum	11.
	Thorax black or blackish, that is, the ground-colour, apart from the three stripes, which, if present, may be subcontiguous and occupy nearly all the dorsum..........................	13.
11.	Basal section of 4th longitudinal vein (*i. e.*, anterior to the fork) one-third as long as fork. Thorax wholly reddish yellow, unmarked	12.
	Basal section of 4th vein much less than one-fourth the length of the fork. Thorax reddish yellow, with three dark stripes	*longifurcata*, sp. n., p. 65.

* Possibly a variety of *P. marginata*.

12. Antennæ brownish yellow; all the veins equally distinct .... *ruficornis*, sp. n., p. 64.
Antennæ black; veins in posterior half of wing very indistinct .... *indistincta*, sp. n., [p. 65.
13. Abdomen wholly black .... *funerea*, sp. n., p. 65.
Abdomen with margins of segments yellowish .... 14.
14. Posterior cross-vein longer and much more transverse; base of 3rd and 4th, 5th and 6th veins indistinct .... *flavomarginata*, sp. n., [p. 66.
Posterior cross-vein shorter, nearly longitudinal; all veins very distinct and black; coxæ yellow, femora and tibiæ distinctly smoky .... *fumipes*, sp. n., p. 66.

9. **Platyura grandis**, sp. nov. (Pl. I, fig. 7.)

♂ ♀. *Head*: vertex and back of head black, face and palpi brown; antennal scape brown, flagellum reddish yellow. *Thorax*: dorsum dull black, with greyish dusting towards the sides and below the shoulders. No conspicuous macrochætal bristles, apparently; a few short stiff bristles in front of the wings, and here and there laterally; sides reddish brown. Scutellum with posterior border a little yellowish, the metanotum with grey dusting. *Abdomen*: 1st segment black (in male with a very narrow pale yellow hind margin); rest of abdomen mainly reddish yellow; base of 2nd segment black, base of 3rd yellowish (less distinct in male), dorsum of segments blackish in male; a faint violet-greyish tinge at basal corners of 4th and 5th segments in female; belly reddish brown, with blackish marks; violet-grey at base of middle segments in female. Genitalia not easily viewed owing to the specimens remaining *in copula*, but apparently normal. *Legs*: coxæ yellowish, fore pair brown at base, anterior pairs white-dusted in front; femora yellowish, posterior ones with a black streak below at base, hind femora in female nearly wholly brown; tibiæ and tarsi blackish yellow. *Wings* pale yellow, hinder part at base nearly clear. A brownish suffusion at tip, extending inwards as far as the tip of upper branch of 3rd vein, and lower branch of 5th; the colour not quite so dark at absolute tip. Halteres yellowish.

Length 9 millim.

Described from a male and female, taken *in cop.*, 22.vi.05 (*types*), and a female on 26.vi.05, all captured by me at Mussoori. A very handsome species. In my collection.

10. **Platyura suffusinervis**, sp. nov. (Pl. I, fig. 9.)

♂ ♀. *Head* wholly black, ocelli large and distinct. *Thorax*: dorsum, scutellum, metanotum; and pleuræ moderately dark shining brown dorsum with rather close dark brown pubescence, and with some bristly hairs towards side margins; sides of thorax and shoulders yellow. *Abdomen*: dorsum blackish, pubescent;

hind margins of segments yellow, the colour extending to, and widening at, the sides; belly black. Genitalia of male composed of a short, very broad, dorsal plate continued over the sides, a pair of claspers with bilobed second joint and some other elongate slender appendages; the whole organ brownish yellow, pubescent; concealed in female, with a pair of small conical moderately thick grey appendages. *Legs*: coxæ and femora brownish yellow, the former with a brown streak on the outer side; tibiæ and tarsi brown. *Wings* pale grey; all the veins very narrowly suffused. A broad light brown stripe from end of 1st longitudinal vein, passing diagonally just before the middle of the wing to the anal border; this stripe a little widened in the middle; a narrow similarly coloured stripe from the middle of the 3rd vein diagonally to the middle of the upper branch of the 4th.

Length 2½ millim.

Described from a male and female in perfect condition in the Indian Museum collection, taken *in cop.* by Lt.-Col. Hall at Sylhet, 10. iv. 05. A very distinct species, also conspicuous by its small size and more robust appearance compared with the other Oriental species.

11. **Platyura apicipennis**, sp. nov. (Pl. I, fig. 8; Pl. III, fig. 4.)

♀. *Head* rather dark brown, vertex yellowish; ocellar protuberance blackish. Antennæ with the 1st joint of scape yellow, 2nd brown; flagellum black, 1st joint a little longer than the others. Underside of head, and mouth-parts, yellow. *Thorax* yellow, semi-transparent;* viewed from a different direction the dorsum appears pale blackish grey, with a tinge of whitish reflections here and there. Entire surface covered with short black hairs, which are longer and bristly about the side margins above the wing. Scutellum concolorous, with a few hairs; sides of thorax yellowish; metanotum and metapleuræ concolorous, slightly dusted with grey. *Abdomen* moderately shining black, minutely pubescent, 1st segment nearly wholly so, the others each with a broad bright yellow posterior margin, which is widest in the middle (and is probably more or less variable), extending to nearly half the segment in the case of the 3rd; belly mainly yellow. *Legs*: coxæ and femora yellow; tibiæ brownish yellow; tarsi black. *Wings* yellowish; a blackish suffusion towards tip, placed just beyond the upper branch of the 3rd vein, the absolute tip being, however, not quite so dark. Halteres brownish yellow.

Length 5½ millim.

Described from a single male in the Indian Museum from Naini Tal, 6000 feet, 2. vi. 09.

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* The pin bearing the specimen can be seen through the thorax.

12. **Platyura affinis**, sp. nov.

♀. Very near *apicipennis*, but the thorax has three distinct black stripes of the usual pattern; sternopleuræ dusted with blue-grey. The terminal lamellæ of the ovipostor can be seen, being small, slightly conical, yellowish. The extreme tip of wing, though lighter than the apical dark suffusion, is still much darker than the corresponding part in *apicipennis*.

Length 5 millim.

The single specimen is from Darjiling, 25. v. 10, taken by me.

Type in the Indian Museum.

13. **Platyura marginata**, sp. nov. (Pl. III, fig. 3.)

♂ ♀. *Head* brownish yellow, vertex and back of head brown, palpi yellow. Antennal scape yellow, flagellum blackish, the joints with a greyish tinge on basal half. *Thorax* brownish, three darker dorsal stripes are visible, seen from behind; a considerable amount of rather stiff black pubescence over the dorsal surface, becoming bristly at the sides above the wings; sides yellow, pleuræ rather dark brown. Scutellum and metanotum brown, former yellowish below posterior margin. *Abdomen* blackish; segments with moderately wide, yellow posterior margins, broadest on 2nd to 5th segments; abdomen minutely pubescent. Genitalia large and conspicuous; a large thick upper plate, somewhat narrowed on the apical half, below which is a pair of large, very conical, two-jointed claspers with strong black claws at their tips; a small ventral plate with a row of spines on posterior margin; the whole organ blackish brown, except the apical part of the claspers and the ventral plate, which are yellow. *Legs* pale yellowish, tarsi black. *Wings* pale yellowish grey, considerably iridescent, tip slightly suffused, the darkening extending nearly to the upper branch of the 3rd vein. Halteres yellowish.

Length 4½–5 millim.

Described from two males from Naini Tal, 6000 feet, 3 and 10. vi. 09.

Type in the Indian Museum.

A specimen in the same collection, also from Naini Tal, 10. vi. 09, is evidently the female of this species. It agrees in all particulars, except that the pleuræ are not darker than the rest of the sides of the thorax, and that the abdomen is broader, the yellow bands narrower, and the infuscation of the wing-tip less distinct.

14. **Platyura flaviventris**, sp. nov.

♀. *Head* brownish yellow, vertex black; antennæ black, scape a little yellowish. *Thorax* (slightly damaged) blackish, anterior and lateral margins of dorsum yellowish, and apparently with a narrow yellow median stripe. Metapleura with a little grey

dusting; metanotum dark brown, shining. *Abdomen* dark brown, moderately shining; base of 1st segment and posterior borders of all the remainder with a distinct, moderately wide, pale yellow band. Belly yellow; genitalia consisting of two small yellow narrow appendages. *Legs*: coxæ and femora brownish yellow, tibiæ and tarsi darker. *Wings* pale grey, tips pale blackish as far inwards as the tips of the upper branch of 3rd vein and the 5th vein.

Length 5 millim.

Described from one female in the Indian Museum, taken by me, 23. ix. 08, at Darjiling, 6000 feet.

15. **Platyura vicina**, sp. nov.

♀. This species is considerably like *P. marginata*, differing essentially in the much darker thorax with still darker stripes; the shoulders being pale yellowish and conspicuous. The scutellum and metanotum are also dark shining brown; the abdominal bands are wider than in *P. marginata* ♀. The basal segment is wholly dark brown.

Length 4 millim.

Two females in the Indian Museum from Naini Tal, 3. vi. 09.

16. **Platyura venusta**, *Walk.*

Platyura venusta, Walker, Ins. Saund., Dipt. pt. v, p. 421 (1856).

♀. *Head* brownish yellow, frons blackish, vertex black, with a little whitish reflection in certain lights; scape brownish yellow, flagellum black. *Thorax* bluish black, with bluish grey reflections, the dorsum with short black hairs; apparently some longer stiffer lateral bristly hairs. Viewed from in front three black stripes can be more or less distinctly seen. Sides of thorax bluish black with whitish grey reflections; scutellum and metanotum concolorous. *Abdomen* black, with short black pubescence; a cream-coloured, well-defined band to the hind margins of the 2nd, 3rd, and 4th segments. Genitalia inconspicuous. *Legs* brownish yellow, coxæ with whitish reflections; base of femora, especially the hind pair, blackish; tibiæ and tarsi blackish; anterior tibiæ with comparatively small spines of unequal length, hind tibiæ with longer spines of equal length. *Wings* pale grey, tip blackish; venation normal. Halteres brownish yellow.

Length 6 millim.

Type. The location of this is unknown.

Redescribed from two females in the Indian Museum, from Bareilly, United Provinces, 15–22. iii. 07, and Chittagong, Assam, 14. vii. 08, the latter taken by Lt.-Col. Hall. There are four specimens in the Pusa collection, from Pusa, 16. iv. 07, iv. 08, v. 07, and from Chapra, Bengal.

There can be no reasonable doubt of the correct identification of this species. Walker described it from the "East Indies." His "testaceous stripe on each side" is a thin yellowish line from above the humerus, running below the lower edge of the dorsum, nearly to the wing-base.

17. **Platyura octosegmentata**, sp. nov.

♂. Head yellowish, vertex rather brownish; ocelli distinct, on a dark, slightly elevated tubercle. Antennæ reddish yellow, also back of head. *Thorax* brownish yellow; dorsum with short scattered black bristles and the lateral margins with stronger ones, especially behind the wings; a few below the shoulders, and a few on the posterior corners, each of which latter bears a large round black spot. Scutellum yellow, with a row of numerous bristles extending over nearly the whole length of the margin. *Abdomen* distinctly 8-segmented; first two segments wholly yellowish; remainder more or less marked with brown towards sides and hind margins; belly yellowish; abdomen above and below with short black pubescence. Genitalia yellowish, inconspicuous, apparently normal, the second joint of the claspers long and slender. *Legs*: coxæ yellowish; tibiæ dirty yellowish white, tarsi blackish. *Wings* pale yellowish grey; halteres yellow.

Length 3 millim.

Described from a single male taken by Mr. A. D. Imms, 9.ix.09, at Allahabad, United Provinces, and kindly presented by him to the Indian Museum.

The abdomen has normally seven segments in this genus; I do not know of any exceptions, but refrain nevertheless from establishing a new genus at present for the reception of this species.

18. **Platyura ruficornis**, sp. nov.

♀. *Head* rather deep brownish yellow; antennæ concolorous, considerably pubescent; vertex blackish, palpi a little darker. *Thorax*, scutellum and metanotum concolorous. Dorsum of thorax covered with short black pubescence, which becomes strongly bristly on the margins, above the wings. Scutellum with a row of bristly hairs on posterior margin, with some smaller ones below these, dorsum bare. *Abdomen* apparently variable; in one example wholly light brown, in two others more yellowish brown, with the posterior parts of the segments more or less black. *Legs* dirty yellowish; coxæ brighter and rather darker, tarsi black. *Wings* distinctly yellowish; halteres brownish yellow.

Length 3–4 millim.

Described from two specimens from Sylhet, Assam, 2.ii.05 and 30.ii.04, and one from Naini Tal, United Provinces, 10.vi.09. All in the Indian Museum.

19. Platyura indistincta, sp. nov.

♂. Near *ruficornis*, but the antennæ are black, broader, and flatter. A little more yellowish about the abdomen. The anterior branch of the 3rd longitudinal vein much closer to the tip of the auxiliary vein than in *ruficornis*. All the veins behind the 3rd longitudinal very indistinct, though perceptible under close observation. Genitalia normal, black, pubescent; 1st joint comparatively large, the 2nd consisting of a black hook.

Length 4½ millim.

Described from one male (*type*) in the Indian Museum, from Kurseong, 20. vi. 10 (*Dr. Annandale*).

20. Platyura longifurcata, sp. nov.

♂ ♀. *Head* mainly black. Proboscis, palpi, and base of antennæ brownish yellow. *Thorax* rather dark brownish yellow; the usual three darker stripes present but indistinct, the whole dorsum with rather thick black pubescence. Scutellum and metanotum concolorous; sides of thorax barely lighter. *Abdomen* blackish, pubescent, hind margins of segment dull yellowish; belly yellowish. Genitalia consisting of a pair of fleshy bilobed forceps, the upper piece larger and longer than the lower one. *Legs* dirty yellow, tips of tibiæ barely darker. *Wings* grey, veins distinct; the 4th longitudinal vein forking very near its base, the petiole in one example (*type*) less than a fourth, in the other example about one-sixth, the length of the branches. Halteres blackish.

Length 4½ millim.

Described from two specimens from Kurseong, 24–26. iii. 10 (*Dr. Annandale*).

21. Platyura funerea, sp. nov.

♀. *Head* nearly black, palpi pale yellow, long and thin; scape of antennæ bright reddish yellow, flagellum black; a small transverse ridge over the base of each antenna. Ocelli two only, very distinct. *Thorax* dull black, shoulders greyish, pubescent, bristly towards side margins; a little yellowish above the pleuræ in front of the wings. Sides of thorax dark brown or blackish; scutellum and metanotum dark brown. *Abdomen* blackish, pubescent; the basal part of the middle segments rather brownish. *Legs* pale yellowish, coxæ with black hairs at tip, tibiæ brownish, tarsi black. *Wings* yellowish; halteres brown.

Length 4 millim.

Described from a single example in the Indian Museum collection from Gangtok, Sikkim State, 6150 feet, 9. ix. 09.

Three ocelli is the normal number, but I refrain from establishing a genus for this species, as I am unaware whether any other species possesses less than the normal number.

22. **Platyura flavomarginata**, sp. nov.

♂. *Head* black, palpi yellow, scape, base of 1st flagellar joint, and underside of one or two succeeding joints, brownish yellow, rest of flagellum black. *Thorax* dark, moderately shining mahogany-brown, with a little grey dusting viewed from certain directions; indistinctly marked with three stripes; lateral margins a little brown, shoulders yellow. Scutellum, metanotum, and pleuræ dark brown. *Abdomen* black, pubescent, posterior margins of segments rather broadly yellow, 1st segment and tip wholly black. Belly similar. Genitalia distinct, black, hairy, having a pair of pointed claspers and a smaller yellow internal organ. *Legs* pale yellowish, tibiæ brownish yellow, tarsi black. *Wings* pale yellow; halteres brownish yellow.

Length 4½ millim.

Described from a single male in the Indian Museum from Naini Tal, 6000 feet, 3. vi. 09.

23. **Platyura fumipes**, sp. nov.

Head yellowish. Proboscis blackish above at the base. Frons shining dark brown, with a median impressed line; back of head still darker brown. Antennal scape yellow, flagellum wholly black. *Thorax*: prothorax yellow, distinctly delineated from the rest of the thorax, which is blackish. Black hairs on the yellowish shoulders. Dorsum dark grey, with rather thick but short black hairs; the usual three black stripes, a little indistinctly outlined but easily visible when seen from behind. Viewed from in front the dorsum appears mainly light grey. Sides of thorax blackish, with a slight grey reflection. *Abdomen* blackish, with short pale hairs, posterior borders of segments distinctly but not widely pale yellowish. Belly similar. *Legs*: coxæ brownish yellow, with a short blackish streak at the tip, on anterior side on the fore pair, on outer side on posterior coxæ. Femora dirty yellow, a little black at the base and tips, especially on the hind pair. Tibiæ and tarsi pale smoky yellow. *Wings* grey; veins very distinct, black, venation normal. Halteres brownish yellow.

Length 8 millim.

Described fron one male from Peradeniya, Ceylon, 22. vii. 10.

Type in the Indian Museum.

Genus **ISONEUROMYIA**, gen. nov.

This genus approximates most closely to *Platyura*. The characters are as follows:—

Head: antennæ considerably flattened, rather more so than in *Platyura*, scapal joints cup-shaped, subequal; the fourteen flagellar joints subequal, the last one a little longer, the first much narrowed

at base. Palpi elongate, incurved. Ocelli very distinct, placed on a vertical protuberance, the outer ones very large, the middle one a little below the others. *Wings* with *all the veins equally and very strongly developed*, except the almost obsolete base of the 4th vein. Auxiliary vein ending before the middle of the wing, just beyond the base of the 3rd longitudinal; subcostal cross-vein placed just beyond the humeral cross-vein. The 1st longitudinal vein thickly spinose with several rows of small spines, the remaining veins each with a single row of microscopic spines. Posterior cross-vein in its normal position at proximal end of the coalesced portions of the 3rd and 4th veins. The 5th, 6th, and 7th veins equally strong, arising close together near the base of the wing, this strength of the veins being the chief generic character.

Range. Assam, Ceylon.

24. **Isoneuromyia annandalei**, sp. nov. (Pl. III, fig. 5.)

♀. *Head* mainly blackish, frons bare, with blue-grey dusting, whitish above the antennæ, ocellar protuberance blackish. Some stiff black hairs behind the head. Epistome and palpi from creamy white to brownish yellow. Antennæ yellowish to reddish brown, a little blackish in some specimens. Proboscis brown. *Thorax* blackish. Dorsum with blue-grey dusting, a median black (not always very distinct) stripe which may be widened in the middle and which dies away towards the posterior margin. Anterior margin of thorax, just below dorsum, light creamy yellowish, the colour extending narrowly laterally. Sides of thorax brownish, pleuræ with white or bluish-white dusting, also the metanotum. Whole thorax shortly pubescent, some stiff bristles below the brownish humeri, and on the lateral margins of the thorax. Scutellum with stiff hairs on the hind margin. *Abdomen* black, minutely pubescent, base of each of first five segments with a somewhat narrow but distinct yellowish band, which appears snow-white if viewed from in front, last segment all black. Genital organs small, oval, creamy yellow. *Legs*: coxæ yellowish, with some stiff hairs, black at tips, fore pair blackish on outer side. Femora brownish yellow, irregularly blackish at base and tips, with short black hairs, which are generally stronger on the upper side, giving it a blacker appearance. In one example all the femora nearly wholly black. Tibiæ and tarsi blackish. *Wings* pale grey, rather glassy in appearance, distinctly iridescent. All the veins very distinctly brown, and all of equal strength (except basal part of 4th longitudinal). A brown suffusion towards the wing-tip, darkest on its anterior part, commencing on the costa, exactly by the upper branch of the 3rd vein, and extending hindwards and outwards in gradually diminishing intensity, sometimes retaining its dark colour as far as the hind margin. A narrow brown suffusion over the coalescence of the 3rd and 4th veins and along the faint basal part of

the 4th vein. The markings vary within reasonable limits. Halteres clear orange-yellow.

Length 9–10 millim.

Described from a nearly perfect female in the Indian Museum from Sylhet, 27. v. 05 (*Lt.-Col. Hall*, type), and four females in my collection from Kandy, Ceylon, v. and vii. 09 (*E. E. Green*).

Apparently the largest known Oriental Mycetophilid.

Subfamily SCIOPHILINÆ.

This subfamily is represented by a well-circumscribed set of species numerously distributed throughout the world and possessing a characteristic cell formed by the upper branch of the 3rd longitudinal vein being so short, so upright, and placed so soon after the origin of the vein, as to be almost parallel to the upright short basal section of the vein, thus enclosing a more or less four-sided cell, which I propose to term the "sciophiline cell," from its being peculiar to this group. Anterior cross-vein present, subcostal cross-vein present or absent, posterior cross-vein always absent. Two or three ocelli present, always remote from the eye-margins except in one (non-Oriental) genus, *Eudicrana*, Loew.

Table of Genera.

The 4th longitudinal vein forks at or a little beyond anterior cross-vein; fork of 5th longitudinal vein beyond fork of 4th ..	Sciophila, Mg., p. 68.
The 4th longitudinal vein forks at least the length of the anterior cross-vein beyond the latter.	
The 3rd longitudinal vein very sinuate. Auxiliary vein ends free or in the costa beyond the sciophiline cell. Three ocelli, the middle one only a little smaller than the laterals	Polylepta, Winn., [p. 78.
The 3rd longitudinal vein straight or gently curved. Auxiliary vein ends either in the costa, in the 1st longitudinal or free. Ocelli two or three; when three, placed together in a triangle in middle of frons, the middle ocellus very minute......................	Mycomyia, Rond., p. 70.

Genus **SCIOPHILA**, *Mg.*

Sciophila, Meigen, Syst. Besch. i, p. 245 (1818).
Lasiosoma, Winnertz, Verh. zool.-bot. Ges. Wien, xiii, p. 748 (1863).

Genotype, *S. hirta*, Mg., as designated by Curtis (British Entomology, p. 641).

Head small, spherical, flattened in front, placed low upon the thorax; eyes oval, slightly emarginate at the base of the antennæ, almost reniform; ocelli three in number, arranged in a flattened triangle upon the broad front or more rarely upon the vertex, the middle one only slightly smaller than the laterals. Palpi incurved, four-jointed, the 1st joint very small, the 2nd and 3rd subequal, the last longer than the others taken together; antennæ projecting forward, arcuated, somewhat compressed, 16-jointed, the two basal joints cupuliform, hairy. *Thorax* oval, highly arched; mesonotum long and thickly haired, not setose; scutellum very small; halteres with short petiole and elongate knob. *Abdomen* seven-segmented, cylindrical, somewhat constricted at the base; hairy in the male, with blunt extremity and small forceps. *Legs* moderately long; the tarsi of the fore legs double the length or rarely more than double the length of the tibiæ; the tibiæ with spurs and with lateral setæ, the fore pair with one or two, the middle pair with three and the hind pair with four rows, the inner rows with only few and weak setæ. *Wings* elongate oval, with rounded base, longer than the abdomen, hairy; hairs sometimes visible to the naked eye. The costa extends considerably beyond the posterior branch of the 3rd longitudinal vein, but does not reach the tip of the wing. The auxiliary vein ends at about the middle of the wing; the 1st longitudinal is long, nearly straight, the 3rd originating from it before the middle of the wing and at a right angle, thence curving gently to the border; the upper branch of it is very short, nearly upright or moderately oblique and placed more or less parallel with and quite close to the erect basal portion of the vein, so as to enclose a quite small oblong, square or rhomboidal cell. This cell is characteristic of the subfamily and may be known as the *sciophiline cell*,* and the anterior cross-vein is always at its lower basal corner. The 4th longitudinal vein forked near the base, the 5th forked at or beyond the middle; the posterior cross-vein absent, 6th longitudinal indistinct and incomplete.

Fig. 9.—Larva of *Sciophila*.

Range. Including *Lasiosoma*, Winn., which Johannsen considers synonymous, the present genus occurs in Europe, Australia, North and South America, and the West Indies, but it has not been previously recorded from the East.

* This is an original suggestion as a name for this cell, which does not appear to have been previously named, yet reference to it is frequently necessary. It might technically be considered the marginal cell but it is never referred to thus.

Life-history. The larvæ of most species of *Sciophila* live not *in* fungi but *on* the underside of the pileus, protected by a coarse webbing spun by them. They are more elongate than most Mycetophilid larvæ, and the pupa is encased in a close cocoon of silk. A peculiarity of the larvæ of some species of this genus is their vivid luminosity, Hudson mentioning a New Zealand species which gave out enough light to be easily visible several feet away.

In Kertész's Catalogue of the Diptera, *Lasiosoma* is admitted as a separate genus and *Mycomyia* (*Mycomya*), Rond., given as a synonym of *Sciophila*. Winnertz's *Sciophila* is an incorrect interpretation of the genus, which was established by Rondani in 1856, and all the species placed by Winnertz in his *Lasiosoma* fall into the present genus. Winnertz's *Sciophila* = *Mycomyia*, Rond.

25. **Sciophila bicolor**, sp. nov. (Pl. I, fig. 10.)

♀. *Head* black, palpi yellowish; scape and base of flagellum reddish yellow, the remainder black. *Thorax* wholly black, dorsum shining, and with rather long, somewhat shaggy, yellowish hairs, which extend a little over the sides, shoulders, humeri, scutellum, and metanotum; the scutellum also with a row of distinct long stiff yellow hairs. *Abdomen* wholly black, rather shining, with short brown hairs; belly similar. *Legs* mainly yellow, narrowly blackish at junction of coxæ and femora; coxæ with moderately long soft yellow hairs; hind femora rather broadly black at base and tip; tibiæ barely darkened towards tips; tarsi black. *Wings* pale yellowish, considerably iridescent, the sciophiline cell exactly square, small, placed immediately below the upper branch of the 3rd vein. Halteres yellow.

Length 3 millim.

Described from two females in the Indian Museum from Darjiling, 7000 ft., 7 and 8. viii. 09 (*Paiva*) (including *type*), and two females, 28. v. 10 (*Brunetti*).

Genus **MYCOMYIA**, *Rond.*

Mycomya, Rondani, Dipt. Ital. Prod. i, p. 194 (1856).
Sciophila, Meigen (part.).
? *Sciobia*, Loew, Bernst. u. Bernst.-fauna, p. 33 (1850).
Sciophila, Winnertz, Verh. zool.-bot. Ges. Wien, xiii, p. 707 (1863).
Empheria, Winnertz, *loc. cit.* p. 738.
? *Cnephæophila*, Philippi, Verh. zool.-bot. Ges. Wien, xv, p. 618 (1865).
Neoempheria, Osten Sacken, Cat. N. Amer. Dipt. p. 9 (1878).

GENOTYPE, *M. marginata*, Mg., designated by Rondani.

Head small, flattened in front, placed low upon the thorax; eyes elongate oval, or round; emarginate at the base of the antennæ; ocelli two or three in number, placed close together upon a rounded, frequently blackened area; when three ocelli are

present they are placed close together in a triangle, the median one very minute; proboscis very short. Palpi incurved, four-jointed, the 1st joint very small, the 2nd somewhat longer, but shorter than the third, the 4th usually as long as or longer than the three preceding taken together; face more or less wide. Antennæ projecting forward, arcuate, longer than the thorax in the male, subequal in the female, somewhat compressed, 16-jointed, the scape differentiated, the first two joints cupuliform, setose at the tip; the flagellar joints cylindrical, pubescent. *Thorax* highly arched, ovate; scutellum small, semicircular in outline, metanotum steep. *Abdomen* slender, seven-segmented, constricted at the base, usually somewhat clavate, particularly in the male, depressed behind, in the male ending in a small forceps, in the female with a short ovipositor terminating in two small lamellæ. *Legs*: coxæ elongate, somewhat setose; legs long and slender; femora ciliated on the flexor surface; tibiæ with lateral setæ, the fore and middle pairs with two, the hind pair with three ranges, the inner row particularly delicate. *Wings* microscopically setulose, somewhat projecting beyond the tip of the abdomen. The costa ends at the tip of the wing or a little before it. The auxiliary vein ends either free (sometimes indistinctly), or in the costa, or in the 1st longitudinal vein. The 1st longitudinal straight or but little curved, the 3rd beginning at a distinct angle, thence straight or nearly so. The sciophiline cell of variable length according to the species. The 4th longitudinal vein forked at or before the middle of its length beyond the anterior cross-vein; posterior cross-vein absent; 5th longitudinal vein widely forked at about the middle of the wing, the 6th and 7th incomplete and indistinct.

Range. Europe, the Orient, Australasia, North and South America, West Indies, Africa. It occurs also in Baltic amber and in recent copal from Zanzibar.

Life-history. Nothing seems to be known of the metamorphosis of any species of this genus, except that the larvæ have been found in fungi and rotting wood.

The species placed in the *Sciophila* of Winnertz belong here. *Neoempheria*, Os. Sac., is hardly a valid genus and is sunk in *Mycomyia*. Two queried synonyms are culled from Johannsen's work on this family.

Table of Species.

1. Auxiliary vein ends free, abruptly; subcostal cross-vein present	*flaviventris*, sp. n., p. 72.
Auxiliary vein ends either in costa or 1st longitudinal vein; subcostal cross-vein present or absent	2.
2. Auxiliary vein ends in costa; subcostal cross-vein present	3.
Auxiliary vein ends in 1st longitudinal; subcostal cross-vein absent	6.

3. Wing with distinct markings..........	4.
Wing quite clear	5.
4 (*a*). Basal third of wing infuscated, and with a band beyond the middle ..	*bifascipennis*, sp. n., p. 72.
(*b*). Apical fourth of wing infuscated, also the posterior margin and the sciophiline cell, both slightly	*tinctipennis*, sp. n., p. 74.
(*c*). Apical and hind margins of wing infuscated, also the inner and outer sides of the sciophiline cell	*ferruginea*, sp. n., p. 74.
(*d*). Tip of wing broadly infuscated, also a band before the middle	*basalis*, sp. n., p. 73.
5 (*a*). Thorax yellowish, with three distinct black stripes....................	*trilineata*, sp. n., p. 75.
(*b*). Thorax brownish yellow, with three faint dark stripes................	*indefinita*, sp. n., p. 76.
(*c*) Thorax dark grey, slightly dusted with violet	*indica*, sp. n., p. 76.
6. Thorax all brownish yellow, two very narrow median brown lines..........	*flavithorax*, sp. n., p. 77.
Thorax with all blackish dorsum except margin and shoulders; 3rd longitudinal vein curved conspicuously downward .	*curvilinea*, sp. n., p. 77.

From the insufficiency of the description, and no mention being made of the veins, it is impossible to include in this table Doleschall's *tropica*, which I should have been glad to add as it is the only previously described species from the East, but it has not yet been found in India.

26. **Mycomyia flaviventris**, sp. nov.

♂ ♀. *Head*: frons and vertex brown, antennal scape yellow, flagellum dark brown, with greyish pubescence. Underside of head, and the palpi, reddish brown. *Thorax* yellowish, paler on shoulders. Dorsum with three practically contiguous broad dark brown stripes, the median one reaching the anterior margin. Bristly hairs on dorsum and moderately strong bristles about the lateral margins. Scutellum yellow, with four strong bristles on hind margin, outer pair the larger, metanotum and metapleuræ a little darker. *Abdomen*: upperside dark brown, belly yellowish. Genitalia enclosed within a large V-shaped ventral plate, the exact structure not visible; dark brown. *Legs*: coxæ yellowish, femora much lighter, tibiæ dirty yellow, tarsi blackish. *Wings* nearly clear, halteres brownish.

Length 3 millim.

Described from a single male in the Indian Museum from Kurseong, 5000 ft., 3. vii. 08, taken by Dr. Annandale; and from a single female, which I refer to this species, from Ohiya, Ceylon, ii. 07 (*Green*), in my collection.

27. **Mycomyia bifascipennis**, sp. nov. (Pl. III, fig. 6.)

♂. *Head* wholly brownish yellow, with short black hairs; palpi

and ocellar triangle blackish. *Thorax* brownish yellow, with short black hairs and stronger bristles. Anterior margin narrowly brown, the colour forming a median stripe, not attaining the hind margin, and also extended laterally from the shoulders. Bristles along sides of dorsum rather strong and numerous, also a strong one on each posterior corner, and a pair on the tip of the scutellum. Pleuræ and metanotum brown. *Abdomen* yellowish, with short black pubescence; 1st segment all yellow, remainder with posterior half of each segment black. Genital organs very conspicuous and peculiar: a high hood-shaped dorsal plate extending downwards at the sides, a slightly curved, very large ventral plate produced at the tip into two long finger-like projections; a pair of elongate appendages emerge from the inner cavity, bearing oval, lamella-like tips, and below these are traces of a pair of slender finger-like appendages nearly as long.* The whole organ light brownish yellow, pubescent. *Legs* wholly brownish yellow, pubescent, tips of tarsi darker. *Wings* pale grey with two brown streaks. The first begins on the costa just before tip of subcosta, running straight across the wing, widening in the middle sufficiently to reach fork of the 4th vein, afterwards narrowing again and finally widening on hind margin. The second begins on the costa just before the tip of the 1st vein, running across the wing to the hind margin, leaving the tip of the wing broadly clear. The sciophiline cell is nearly three times as long as broad, the base of the 3rd vein bisinuate, the cross-vein forming the outer side of the cell broadly suffused. Base of wing slightly brown. Halteres pale yellow.

Length 4 millim.

Described from a male (*type*) from the Kumaon District, 5700 ft., vii. 1909 (*Imms*), and a male in my collection from Maskeliya, Ceylon (*Green*).

Type in the Indian Museum.

28. **Mycomyia basalis**, sp. nov. (Pl. I, fig. 13.)

♂. Near *M. tinctipennis*, Brun. (*infra*). *Thorax*: dorsum brownish yellow, with some long yellow hairs and black bristly ones. Two dorso-central rows of black bristly hairs, of which at least the hinder three pairs are of larger size than the majority of those scattered over the dorsum. Two strong bristles on posterior corners, others irregularly placed on lateral margins, around the base of the wing, and a pair of rather strong apical ones on the scutellum. *Abdomen* with the first segment bright yellow, 4th dull yellowish; remainder black, with barely perceptible hind margins. Belly mainly yellowish. Genitalia large and conspicuous, brownish yellow, pubescent; a very short dorsal plate, as wide as the ultimate abdominal segment, under which it is nearly hidden;

* These are not shown in the figure.

a large pair of claspers, elongate, conical, much flattened, and bisinuate, produced on the lower side into a finger-like appendage; a globular piece between the claspers above, just beyond the dorsal plate, and apparently some intermediate appendages. *Wings* marked as in *tinctipennis*, but the apical spot much darker, and the proximal spot over the sciophiline cell is extended to a rather dark, irregular brown streak reaching hind margin of wing.

Length 3 millim.

One example from Bhowali, 5700 feet, Kumaon, July 1909 (*A. D. Imms*).

Type in the Indian Museum.

Since the description of the species, the abdomen of the type, and only specimen, has become detached and lost.

29. **Mycomyia tinctipennis**, sp. nov. (Pl. I, fig. 11.)

Head yellow; antennal scape brownish yellow, about the basal half of flagellum yellowish brown, changing to black towards tip; palpi blackish. *Thorax* (*somewhat crushed*) uniformly yellowish brown; lighter at sides; pleuræ rather dark grey. Dorsum with some bristly hairs, apparently more or less longitudinally arranged. *Abdomen*: basal half blackish above, yellowish below (remainder missing). *Legs*: coxæ and femora pale yellow, tibiæ and tarsi pale blackish. *Wings* pale yellowish grey; slightly suffused over distal half; over the cross-veins, enclosing the sciophiline cell, which is approximately square; faintly also behind the 5th longitudinal vein. Halteres yellow.

Length probably about 3½ millim.

Described from a single specimen from Kurseong, 3. vii. 08 (*Annandale*).

Type in the Indian Museum.

The thorax is slightly crushed, and the apical half of the abdomen is missing, so that the sex is uncertain. I would not have described the species but that the wing markings are probably sufficient to distinguish it.

30. **Mycomyia ferruginea**, sp. nov. (Pl. I, fig. 12.)

♂ ♀. *Head* wholly yellow, except palpi, a narrow line from above antennæ to behind head, flagellum, and eyes, all of which are black. Scape yellow with some bristly hairs above. *Thorax* yellow. Dorsum with four dark brown equidistant stripes, the outer ones placed nearly on the sides (*type* specimen). They converge somewhat towards the posterior margin and are joined behind into two pairs by short cross-lines. In the second example there is a distinct additional median narrow line between the two inner stripes, of which in the type there is a trace only near the fore border. Sides of thorax, scutellum, and metanotum concolorous in type; paler yellow in second specimen. Two distinct dorso-

central bristles, a double row of median microscopic bristly hairs, and an irregular row (duplicated here and there) of bristly hairs of various lengths along the black stripes. Some moderately long bristles about the shoulders and humeri, on the posterior corners of dorsum, and several distinct bristles on the lateral margins above the wings. Small bristly hairs occur here and there irregularly. Scutellum with two pairs of strong spiny bristles on posterior margin. *Abdomen* orange-yellow. In one example (*type*) there is a black dorsal stripe of moderate width, with a tendency to enlargement on posterior margins. Whole abdomen lightly covered with short yellow hairs. Lateral edges of dorsum narrowly black; belly orange-yellow. In the second specimen the black colour is not so distinctly in the form of a line, being more irregular and forming a distinct band on the penultimate segment. Genitalia in both sexes small, withdrawn. *Legs*: in type, orange-yellow (in second example, pale yellow); tibiæ in both specimens pale brownish yellow towards tips; tarsi black. *Wings* pale grey, yellowish from costa to 3rd longitudinal vein. Inner cross-vein, and the upper branches of 1st and 3rd veins distinctly but narrowly suffused.* A slight darkening at wing-tip, at the forking of the 4th vein (*type*) or from thence along the hind margin (2nd specimen). Halteres yellow.

Length 4–4½ millim.

Described from two males in the Indian Museum, one taken by Dr. Annandale at Kurseong, Darjiling, 3. vii. 08, the other from Calcutta, 11. ii. 90, and one female from Darjiling, 29. v. 10, taken by me, also in the same Museum.

In spite of the additional median thoracic line and the slight difference in the disposition of the black colour on the abdomen, and the deeper general colour of the type, I believe that the two specimens are conspecific.

31. **Mycomyia trilineata**, sp. nov.

♂. *Head*: frons, vertex, back of head and flagellum, black; face and epistome, palpi and scape bright yellow. *Thorax*, scutellum, and metanotum pale yellowish. Three brown stripes of the usual pattern, the median one the longest, reaching fore border, and very narrowly divided. Seen from behind, the stripes, and also the pleuræ, have a slight bluish-grey tinge. Bristly hairs, as in *M. ferruginea*. The minute bristly hairs of the dorsum, irregularly placed; they also line the edges of the dark stripes, which themselves are bare. *Abdomen*: dorsum mainly black, posterior margins of first five segments broadly yellow; belly yellow. Surface of abdomen with black hairs which are stronger towards tip. Genitalia composed of a large dark semicircular plate, the claspers and appendages slender, yellowish. *Legs* pale yellow; posterior femora with a row of well separated, rather long hairs below; tibiæ brownish yellow; tarsi black. *Wings* pale grey, iridescent:

* The sciophiline cell 2–2½ times as long as broad.

sciophiline cell one-and-a-half times as long as broad. Halteres yellow.

Length $3\frac{1}{2}$ millim.

Described from two specimens in the Indian Museum, from Simla, 7000 feet, 10. v. 09 (*Annandale*).

32. **Mycomyia indefinita**, sp. nov.

♂ and (?) ♀. *Head* brownish on vertex and frons; proboscis and palpi yellowish, the latter a little darker. Antennal scape bright yellow, flagellum black, with whitish pubescence, basal half of 1st joint yellowish. *Thorax* brownish yellow, the three usual stripes distinct but not conspicuous. Some bristly hairs towards the sides and posterior margins of the dorsum. Scutellum and metanotum concolorous; sides of the thorax a little more yellowish. *Abdomen* blackish, base of some of the segments yellowish. Genitalia enclosed in a large cavity, and presenting two fan-shaped pieces with pubescent edges and a pair of smaller club-shaped organs. *Legs* pale yellowish, the tibiæ and tarsi faintly blackish. *Wings* clear grey, venation normal. Halteres pale yellowish.

Length 3 millim.

Described from one male and another specimen from Darjiling, 29. v. 10, taken by me, and now in the Indian Museum.

In the second specimen, there are two flat spatula-shaped pieces which may be the female lamellæ terminating the short ovipostor, but as the organs in this specimen are much withdrawn it is impossible to be sure of the sex.

33. **Mycomyia indica**, sp. nov.

♂ ♀. *Head*: frons, vertex, and back of head black; head in front below antennæ, and palpi, yellow. Antennal scape and base of flagellum bright yellow, remainder black. *Thorax* primarily light yellowish brown, with a distinct but slight violet-grey dust on dorsum. A median brown stripe usually present and faint traces of a very elongated oblong mark narrowly defined with pale brown, on each side of the median stripe, all the lines microscopically punctuated with bristly hairs. Shoulders yellowish, the colour extending posteriorly more or less, occasionally the whole dorsum brownish yellow. Sides of thorax mainly brownish yellow, pleuræ with violet-grey dusting. Scutellum and metanotum brownish yellow, varying in shade, generally with a little violet dusting, the metanotum sometimes with a dark spot on each side at the base, and a larger one on the lower margin. *Abdomen* brown, with short black hairs; posterior margins of segments broadly yellow. Genitalia of male moderately large, pubescent, a large upper and lower dark coloured plate, united at the sides, enclosing a longer and a shorter pair of thin yellow claspers, with, apparently, some smaller intermediate organs; in

female, inconspicuous, narrow, yellow. *Legs* pale yellow, a little blackish about the junction of the coxæ and the femora; the tibiæ blackish yellow; tarsi black. *Wings* pale grey, slightly vitreous and extremely iridescent, the sciophiline cell about one-and-a-half times as long as broad, upper side distinctly longer than lower. Halteres pale yellow.

Length 3¼–4 millim.

Described from five males and one female in the Indian Museum taken 10–12. v. 09, by Dr. Annandale, at Simla and Phagu.

34. **Mycomyia flavithorax**, sp. nov.

♂. *Head*: vertex dark brown; proboscis light brown, palpi blackish. Antennal scape yellow, flagellum black, with whitish rather thick pubescence. *Thorax* light brownish yellow. A pair of interrupted incomplete median brownish stripes, with a shorter and more distinct one on each side towards the wing. All the dorsum with long black hairs, stiffer ones towards the margins. Scutellum concolorous, with four stiff bristly hairs on the hind margin. Sides concolorous, metanotum blackish. *Abdomen* blackish; base of most of the segments yellowish, especially towards the sides. Belly with the basal half of the segments yellowish, hinder half blackish. Genitalia large, conspicuous; each clasper with a large basal subquadrate piece, with a narrow finger-like hook at the tip. There are also some other elongate appendages; the whole organ brownish yellow, moderately pubescent. *Legs*: coxæ and femora yellowish, tibiæ and tarsi pale blackish. *Wings* pale grey. Venation normal. Halteres yellowish.

Length 2½ millim.

Described from a single male in the Indian Museum collection taken by Dr. Annandale at Darjiling, 25. v. 10.

35. **Mycomyia curvilinea**, sp. nov.

♂. *Head*: vertex brownish grey. Proboscis and palpi brownish yellow. Antennal scape and base of 1st flagellar joint yellowish, the remainder black. *Thorax* rather dark brown, with numerous long black hairs, and more bristly ones towards the lateral margins; shoulders rather broadly reddish or yellowish. Scutellum concolorous, with four large bristly hairs on the hind margin. Sides of thorax and metanotum concolorous. *Abdomen* mainly blackish, the bases of the segments yellowish. Belly mainly yellowish. Genitalia large and conspicuous; a large basal joint to each clasper, ending in two finger-like appendages; between the basal joints, a pair of long narrow forceps, two-jointed, both elongated, the second consisting of a long horny hook-like process. There is an apparently more or less horny straight flat narrow piece projecting from below the dorsal plate (this latter of moderate size, oblong, yellowish, pubescent); slightly enlarged at

the tip, where it ends in two minute points. *Legs*: coxæ and femora pale yellowish, tibiæ and tarsi pale blackish. *Wings* pale grey. The 3rd longitudinal vein considerably bent down on the distal portion, ending at or just above the tip of the wing. Halteres yellowish.

Length 3 millim.

Described from one male (*type*) from Tonglu, Darjiling District, 10,000 ft,, 22. iv. 10, taken by Mr. C. W. Beebe; also from a second male taken by me at Darjiling, 7000 ft., 29. viii. 10.

Type in the Indian Museum.

An additional male has a wholly blackish dorsum to the abdomen, and the genitalia, though too contracted to be properly visible, appear to be similar; some finger-like appendages at least being visible. It is in the Indian Museum collection, taken by Dr. Annandale at Kurseong, 22. vi. 10. Though possibly distinct the three specimens appear to represent but one rather variable species.

Genus **POLYLEPTA**, *Winn.* (Pl. I, fig. 14.)

Polylepta, Winnertz, Verh. zool.-bot. Ges. Wien, xiii, p. 745 (1863).

GENOTYPE, *P. undulata*, Winn., by designation of Johannsen (Gen. Ins., Fasc. 93, p. 43).

Head small, flattened in front, placed low upon the thorax; eyes oval, somewhat emarginate at the base of the antennæ; ocelli three in number, placed in a more or less curved line on the broad front, the middle one smaller than the laterals. Palpi incurved, four-jointed, the 1st joint very small, the 2nd and 3rd subequal, the last one longer than the others taken together. Antennæ projecting forward, somewhat compressed, 16-jointed, the basal joints cupuliform, the flagellar joints cylindrical; pubescent. *Thorax* very short, highly arched; mesonotum high, scutellum small; halteres with elongate knobs. *Abdomen* long and slender; in the male somewhat clavate; genitalia small; abdomen in the female cylindrical, constricted at the base, seven-segmented. *Legs* long, tibiæ with spurs and with lateral setæ. *Wings* elongate oval, not longer than the abdomen, with microscopic hairs. Costa ends at or just before tip of wing. Auxiliary vein ends before middle of wing, sometimes in the costa, sometimes free. The 1st longitudinal nearly straight, the 3rd bisinuate, sometimes very considerably so, beginning at about one-third of the wing. Sciophiline cell small; the 4th and 5th longitudinal veins forked widely at about half their length; posterior cross-vein absent, 6th and 7th veins incomplete but long.

Range. Only previously known from Europe, with a single species from North America. One is recorded from Baltic amber.

Life-history unknown.

The two Indian species are very closely allied and may possibly prove identical. Their differences are as follows:—

Length 5 mm.; sciophiline cell square .... *dubiosa*, sp.n., p.79.
Length 3 mm.; sciophiline cell nearly twice as long as broad .... *incerta*, sp.n., p.79.

36. **Polylepta dubiosa**, sp. nov.

♂. *Head*: vertex blackish grey; proboscis and palpi rather bright brownish yellow. Antennal scape bright yellow, joints subequal; flagellar joints brown (except base of 1st), cylindrical (1st a little longer), all with rather thick pale pubescence. *Thorax* rather dark brown, with a slight claret tinge, some long yellow hairs around the margins, and the whole dorsum covered with very short and sparse yellow hairs irregularly placed. Shoulders broadly bright yellow, a brown elongate spot on each side of the prothorax. Scutellum brownish, with a row of numerous hairs on the hind margin; metanotum concolorous. *Abdomen* black, with moderately thick pale pubescence. A pale brownish yellow basal band on each segment after the 1st, which, with the ultimate segment, is wholly black, the yellowish bands being continued on the underside. Genitalia consisting of a dorsal plate, claspers with a comparatively large basal joint; an intermediate pair of small bilobed appendages, and possibly other inner organs. *Legs*: coxæ and femora yellowish, trochanters and tips of femora a little blackish, tibiæ and tarsi pale blackish. *Wings* pale grey; venation in accordance with the generic characters and figure by Johannsen (Gen. Ins., Fasc. 93, pl. 4, fig. 6). Halteres pale yellow, clubs blackish.

Length 5 millim.

Described from one male from Mundali, Jaunsa Division, Dehra Dun District, 9000 ft., 10. v. 10 (*C. W. Beebe*).

Type in the Indian Museum.

Only two ocelli are apparent in the present specimen, yet in other respects it agrees with *Polylepta*.

37. ? **Polylepta incerta**, sp. nov.

? ♀. *Head*: vertex dark brown; ocelli very distinct, yellow; proboscis brown, small; palpi pale yellow. Antennal scape and base of 1st flagellar joint brownish yellow, remainder black. *Thorax* brownish yellow; three conspicuous broad black stripes of the usual pattern, the median one attaining the anterior margin. Dorsum with irregular short and long hairs; two strong bristly ones above the wing, and four on the border of the scutellum, which is black on the dorsum and yellow at the base and around the whole margin; metanotum and pleuræ blackish brown. *Abdomen* blackish, with pale pubescence, more or less yellowish about the

apical half of the first three segments. Belly yellowish. *Legs* pale yellowish, trochanters a little blackish; tibiæ and tarsi faintly blackish. *Wings* pale grey, considerably iridescent; venation normal.

Length 3 millim.

Described from a single specimen in the Indian Museum from Mundali, Jaunsa Divison, Dehra Dun District, 12. v. 10 (*C. W. Beebe*).

Apparently the example is a female; the genitalia are much withdrawn, but two small rounded pieces can be seen, which seem to be terminal lamellæ. Otherwise, if the specimen is a male the genital organs differ in shape considerably from typical forms.

Subfamily MYCETOPHILINÆ.

Table of Genera.

1. Proboscis conspicuously elongated into a long beak	Gnoriste, Mg., p. 82.
Proboscis never thus elongated	2.
2. Auxiliary vein ending in costa and at least half as long as 1st basal cell ..	3.
Auxiliary vein not ending in costa; when long, ending in 1st longitudinal vein or with its end free; generally short, with end free	12.
3. Basal section of anterior branch of 4th longitudinal vein wanting	Odontopoda, Aldr., p. 89.
Basal section of anterior branch of 4th longitudinal vein present	4.
4. Subcostal cross-vein present	5.
Subcostal cross-vein absent	8.
5. Basal section of 3rd longitudinal vein many times longer than anterior cross-vein. (The 5th longitudinal vein forks at base of wing.)	Allactoneura, Meij., [p. 88.
Basal section of 3rd longitudinal vein barely (if at all) longer than anterior cross-vein	6.
6. Auxiliary vein enters costa very near the origin of the 3rd longitudinal vein.	Leptomorphus, Curt., [p. 84.
A distinctly appreciable space between the tip of the auxiliary vein and the origin of the 3rd vein	7.
7. The 4th longitudinal forks at about one-fourth of its length	Leia, Mg., p. 96.
The 4th longitudinal forks at nearly half its length	Acrodicrania, Skuse, [p. 92.
8. The 5th vein forks before or under the fork of the 4th vein	9.
The 5th vein forks beyond the fork of the 4th	Phronia, Winn. (pt.), [p. 110.

9. The 4th vein forks (after quitting the anterior cross-vein) at not before one-fourth of its length* .... 10.
The 4th vein forks almost immediately after quitting cross-vein............ DELOPSIS, Skuse (pt.), [p. 118.
10. Petiole of 4th vein equal in length to the branches...................... ANOMALOMYIA, Hutton, [p. 90.
Petiole of 4th vein one-fourth the length of the branches.................... 11.
11. The 3rd vein begins at or before middle of 1st longitudinal vein .... PALÆOANACLINIA, Meun., [p. 85.
The 3rd vein begins near tip of 1st longitudinal .... GREENOMYIA, gen. nov., [p. 87.
12. Costal vein ending beyond tip of 3rd longitudinal (if but slightly, then auxiliary vein long, and ending in 1st longitudinal) .... 13.
Costal vein not extending beyond tip of 3rd longitudinal vein .... 15.
13. Lateral ocelli not adjacent to eye margins........................ .... MACROBRACHIUS, Dzied., [p. 108.
Lateral ocelli contiguous or sub-contiguous to eye margins .... 14.
14. Costal vein extending but little beyond tip of 3rd longitudinal vein; 6th vein short .... PHRONIA, Winn. (pt.), [p. 110.
Costal vein extending some little distance beyond tip of 3rd longitudinal vein; 6th vein nearly reaching fork of 5th vein .... MACROBRACHIUS, Dzied. [(pt.), p. 108.
15. Three distinct ocelli, the lateral ones widely removed from eye margins; base of 3rd longitudinal vein beyond middle of wing; anterior branch of 4th longitudinal vein detached at base .. CLASTOBASIS, Skuse, p. 94.
Lateral ocelli nearly or quite contiguous to eye margins.................... 16.
16. Setæ of hind tibiæ slender, little, if any, longer than the diameter of the tibiæ. 17.
Setæ of hind tibiæ distinctly stouter, at least twice as long as diameter of tibiæ............................ 20.
17. The 5th longitudinal vein forks before fork of 4th vein .... 18.
The 5th longitudinal vein forks beyond fork of 4th vein .... 19.
18. The 6th vein very stout, ending usually a little beyond the fork of the 5th vein; 5th vein forking very narrowly at base, the lower branch beyond the middle, suddenly diverging downwards; the fork before the proximal end of anterior cross-vein........................ RHYMOSIA, Winn., p. 102.
The 6th vein slender and inconspicuous. ALLODIA, Winn., p. 107.

* Except in some species of *Rhymosia*.

19. The 4th longitudinal vein forks beyond end of basal cell; the costa extends very little beyond tip of 3rd vein; ocelli three, the middle one very small. PHRONIA, Winn., (pt.), [p. 110.
The 4th longitudinal vein forks before end of basal cell; the middle ocellus present or absent............ EXECHIA, Winn., p. 112.
20. Auxiliary vein ends in 1st longitudinal; the branches of the 5th vein diverging. DELOPSIS, Skuse, (pt.), [p. 118.
Auxiliary vein ends free; the branches of the 5th vein parallel along their apical third or half, or only very slightly convergent or divergent .... MYCETOPHILA, Mg., [p. 113.

The fact that several genera fall into two or more parts each of this table proves that a satisfactory classification is still a desideratum. My own special study of the family is too limited to Oriental, and a certain number of European, species to permit me to suggest any wide departure from the classification of Johannsen, who appears to be the latest authority on the group. Distinctions like those employed at points 8, 12, 16, and 17 may perhaps be improved upon when a further knowledge of the world's species is attained, no classification being satisfactory that is founded on the species of one zoological region only. For this reason the order in which the genera are described herein (which is intended to show their affinities as nearly as possible) varies from that in which they appear in this table. The absence of the posterior cross-vein, in conjunction with the unforked 3rd vein, will easily distinguish members of this subfamily.

Genus **GNORISTE**, *Mg.* (Pl. I, fig. 15.)

Gnoriste, Meigen, Syst. Besch. i, p. 243 (1818).

GENOTYPE, *G. apicalis*, Mg., the original species.

Head small, rounded, almost hemispherical, placed low upon the thorax; proboscis prolonged, beak-like; eyes elongated, somewhat bulging, slightly emarginate at the base of the antennæ; ocelli three, placed in a flattened triangle upon the broad front, the middle one smaller. Palpi situated near the tip of the proboscis, four-jointed, the 1st joint very small, the 2nd largest, the 3rd and 4th oval. Antennæ 16-jointed, arcuate, projecting forward, the joints of the scapus bare, the flagellar joints compressed, cylindrical, pubescent. *Thorax* ovate, highly arched; scutellum small, semicircular in outline: metanotum steep, somewhat arched. *Abdomen* long and slender, compressed, 7-jointed, in the male with an almost clavate extremity and small forceps. *Legs* long and slender, all tibiæ with lateral setæ, and with spurs. *Wings* large, oval, microscopically setulose. Costa produced beyond tip of 3rd longitudinal vein but not quite reaching wing-tip; subcostal cross-vein present, before the origin of the 3rd vein. Auxiliary vein ends near middle of wing; 1st longitudinal a little

curved, ending a little beyond it, the 3rd vein originating near middle of wing at an angle, thence gently bisinuate, the anterior cross-vein placed at the angle. The 4th longitudinal forks just beyond the anterior cross-vein, the 5th at about the same distance; 6th vein strong but incomplete.

Range. Europe, Greenland, North America, Chili, Himalayas.

Life-history unknown.

Easily recognised, being the only Oriental genus with a produced proboscis.

The two Indian species may be separated thus:—

Thorax yellowish, with three dark stripes; proboscis as long as height of head, not spatulate at tip	*brevirostris*, sp. n., p. 83.
Thorax shining black on dorsum; proboscis one-and-a-half times height of head, the long broad labella giving it a spatulate appearance	*spathulata*, sp. n., p. 84.

38. **Gnoriste brevirostris**, sp. nov. (Pl. III, fig. 7.)

♂. *Head*: vertex, frons and face blackish; three ocelli, yellow, distinct, in centre of frons, the middle one lower and smaller. Proboscis about as long as the height of the head, broadly conical; dark brown, nearly black, with a little pale, very short pubescence; labella distinct, brown; palpi pale yellow, long. Antennal scape bright yellow, first two or three flagellar joints yellow, the remainder black, with whitish pubescence. *Thorax* yellowish, with three broad shining black stripes, the median one reaching the anterior margin, the outer ones a little shorter; all three united behind on the posterior margin. Scutellum blackish. Sides of thorax yellowish, pleuræ and metanotum dark brown. Stiff yellow hairs towards the margins of the thoracic dorsum, and a row of very small stiff hairs on the median stripe; in addition there are irregular, short hairs scattered over the whole of the dorsum. *Abdomen* black, with pale pubescence, posterior margin of segments with a dull dirty yellow band; belly similar; genitalia consisting of several comparatively small pale yellow appendages enclosed in an outer blackish cup-shaped cavity. *Legs* pale yellowish, trochanters and tarsi blackish. *Wings* pale grey; venation normal; most of the longitudinal veins extremely narrowly suffused with brown. Halteres yellowish.

Length 5 millim.

Described from a single male from Mundali, Jaunsa Division, Dehra Dun District, 9000 ft., 12. v. 10 (*C. W. Beebe*).

Type in the Indian Museum.

Owing to the drying of the wings the subcostal cross-vein is barely visible, but it is present between the auxiliary vein and the 1st longitudinal, about half-way between the humeral cross-vein and the origin of the 3rd longitudinal.

39. **Gnoriste spathulata**, sp. nov. (Pl. III, fig. 8.)

♂. *Head*: vertex and frons black, a little shining, with a few stiff hairs. The ocelli very distinct, reddish brown, the outer ones large, the middle one only a little smaller and barely lower on the frons. Proboscis one-and-a-half times the height of the head, brownish yellow, with long broad labella, giving a broad spatulate appearance to the tip of the proboscis. Palpi pale yellow, long. Antennal scape and first two or three flagellar joints yellow, the remainder light brown, with rather thick whitish pubescence. *Thorax*: dorsum shining black, prothorax yellowish; pleuræ dark brownish black. Scutellum black, a little pale on underside; metanotum dark blackish brown. *Abdomen* black, the first two segments with a brownish tinge, a few pale hairs; belly similar. The genitalia (not easily seen) appear to consist of a dark rather pointed pair of claspers bearing an elongate yellow finger-like appendage near the tip, and a peculiar large leaf-shaped whitish scale; there is also a comparatively small ventral V-shaped blackish plate. *Legs* rather bright yellow, base of the femora a little brownish, tarsi darker. (Fore legs missing, except coxæ.) *Wings* grey, the apical third and front border a little darker. Venation normal. Halteres deep yellow, rather large.

Length 4 millim.

Described from a single male from Darjiling, taken by myself, 29. v. 10.

Type in the Indian Museum.

Owing to the drying of the wings the subcostal vein is not apparent, and I am under the impression that in this species it may be absent.

Genus **LEPTOMORPHUS**, *Curt.* (Pl. II, fig. 1.)

Leptomorphus, Curtis, Brit. Entom. p. 365 (1831).

GENOTYPE, *L. walkeri*, Curt.; by original designation.

Head small, round, much narrower than the thorax, nearly hemispherical, slightly flattened, placed low upon the thorax; proboscis somewhat projecting; eyes oval, emarginate at the base of the antennæ; ocelli three in number, placed in a flattened triangle on the front, the middle one smaller than the laterals. Palpi cylindrical, incurved, four-jointed, the 1st joint very small, the 3rd nearly twice as long as the 2nd, the 4th somewhat longer than the 3rd. Antennæ long, filiform, projecting forward, 16-jointed; the basal joints differentiated, the 2nd small, with setæ at the tip; the flagellar joints cylindrical, somewhat compressed, pubescent. *Thorax* short, oval, highly arched; mesonotum with setæ only at the sides; metanotum high, strongly arched. *Abdomen* very long, slender, nearly linear, compressed, seven-jointed, with short terminal joint; the male with moderate forceps. *Legs* long, slender, the tibiæ with long spurs and very minute

lateral setæ; fore metatarsi longer than the tibiæ. *Wings* elongate oval, shorter than the abdomen, setulose. Costa ends just beyond tip of 3rd vein. Subcostal cross-vein present, placed near tip of auxiliary vein which latter ends before or after the middle of the wing; 1st longitudinal nearly straight, long; 3rd begins at or before middle of wing at an acute or a right angle, straight nearly to the wing-tip; the anterior cross-vein at the deflection. The 4th and 5th veins widely forked, the latter much before the former; the 6th and 7th veins incomplete and short.

Range. Europe, Assam; of the only two previously known species, one is European, the other is from an unknown locality.

Life-history unknown.

"This genus resembles *Boletina* most closely, but differs in having longer legs, the fore metatarsi being longer than the corresponding tibiæ, and in a relatively longer petiole of the media,* the petiole being about half as long as the anterior branch. There are several undescribed North American species of *Boletina* which closely approach *Leptomorphus*." (Johannsen.)

40. **Leptomorphus ornatus**, sp. nov.

♀. *Head* wholly bright chrome-yellow; antennæ (tips broken off) slightly brownish on upper half. Ocellar triangle black. *Thorax*: dorsum shining indigo-black. Shoulders, scutellum and sides (except pleuræ, which are shining black), bright yellow. Metanotum brown, lighter at the sides. *Abdomen* rich brown, shortly pubescent; 1st and 2nd segments all brown, 3rd, 4th and 5th with a broad basal yellow band, 6th all brown, 7th brown with a narrow yellow tip. Genitalia very small, yellow. *Legs* pale yellow, tarsi brownish; hind femora very slightly brown at base above, and at tips. *Wings* pale grey, with microscopic hairs; apical part brownish, the colour stretching across the wing from just before the tip of the 1st longitudinal vein to the hind margin, cutting the middle of the branches of the 4th vein. Upper branch of 5th vein wavy. Halteres yellow, clubs black.

Length 7 millim.

Described from a single female in the Indian Museum from Sylhet, 3. ii. 05 (*Hall*).

A very distinct and handsome species, having generic characters agreeing exactly with those of *Leptomorphus*; the fore metatarsus is about one and a half times as long as the fore tibia.

Genus **PALÆOANACLINIA**, *Meun.* (Pl. II, fig. 7.)

Palæoanaclinia, Meunier, Monog. Mycetoph. p. 143 (1904); Johannsen, Gen. Ins., Fasc. 93, p. 85 (1909).

Genotype, *P. distincta*, Meun.; by original designation.

Head small, rounded, flattened in front, placed low upon the

* The "media" is the 4th longitudinal vein.

thorax; eyes oval, emarginate at base of antennæ; ocelli three, arranged as a flattened triangle, the middle one small. Palpi 4-jointed, incurved; 1st joint small, the last one the longest. Antennæ projecting forward, longer than head and thorax taken together, those of the male the longer; 16-jointed, scapal joints cupuliform, the flagellar joints cylindrical, rather compressed, pubescent or nearly bare. *Thorax* short, oval, highly arched, metanotum high, somewhat arched, scutellum small. *Abdomen* of seven segments, long and slender, cylindrical, that of the male with a short forceps; in the female with very short ovipositor, at tips of which are two small lamellæ. *Legs* long and slender, femora slender, slightly compressed, tibiæ with spurs and weak lateral setæ, fore metatarsus shorter than corresponding tibia. *Wings* elongate oval, base somewhat rounded, as long as or rather longer than the abdomen, microscopically setulose. Costa extending beyond tip of 3rd vein; auxiliary vein of moderate length, ending before middle of wing; 1st longitudinal ending at about two-thirds of the wing, straight. The 3rd vein beginning at about the middle of the wing at a right angle, thence nearly straight, its basal portion appearing almost like a cross-vein. Anterior cross-vein moderately long, distinctly oblique, 4th longitudinal forked before half its length, the branches diverging towards their tips, 5th longitudinal similarly forked, the fork occurring just below the anterior cross-vein; 6th vein short, incomplete, 7th longer and more distinct.

Range. Europe and North America (recent) and in Baltic amber. Only three living species are known, occurring in Austria, Finland and Alaska; there are three fossil ones.

Life-history unknown.

41. **Palæoanaclinia flavohirta**, sp. nov.

♂. *Head* wholly black, except extreme tip of 2nd scapal joint of antennæ which is narrowly yellow, and the flagellum which is dark brown, with short, pale pubescence. A few yellow hairs behind head. *Thorax*: dorsum black, shoulders and lateral margins as far as wings, and the pleuræ, with grey dusting. Three dorso-central rows of yellow hairs, and a number of strong bristles, apparently irregularly placed, along the lateral and posterior margins. Scutellum and metanotum black, former with yellow hairs on hind margin. *Abdomen* shining black, with pale hairs, of only six distinct segments; 1st segment a little compressed, remainder somewhat broad. *Legs* pale yellowish, tibiæ darker towards tips, posterior coxæ and all tarsi black. *Wings* pale brownish; halteres yellow.

Length 3½ millim.

Described from a single specimen in the Indian Museum, from Darjiling, 11. viii. 09 (*Dr. Jenkins*).

I place this species in *Palæoanaclinia* which is said to possess seven abdominal segments, but the present specimen has certainly only six.

Genus GREENOMYIA, gen. nov.

GENOTYPE, *G. nigricoxa*, sp. nov.

Near *Palæoanaclinia*, Meunier.

Wings: auxiliary vein half as long as 1st longitudinal, faint but distinct; subcostal cross-vein absent; 3rd longitudinal emerging from 1st near its tip, comparatively short, reaching margin of wing some distance before tip; costa not produced beyond tip of 3rd; cross-vein more oblique than in *Palæoanaclinia.* Petiole of 4th vein rather more than one-fourth the length of the (parallel) branches, the upper one of which ends at extreme wing-tip; 5th vein forks immediately under tip of subcostal, distinctly before fork of 4th, its branches parallel. Anal vein (6th) strong, straight, parallel to petiole of 5th, and ending just beyond fork of latter, 7th absent. Ocelli three, in a straight row in centre of frons, no ocellar protuberance. *Abdomen* 6-segmented (♂). *Legs* moderately stout; tibiæ spurred, posterior pairs with three rows of setæ.

The ♀ is unknown.

It is with much pleasure that I name this genus after Mr. E. E. Green, of Ceylon, who has done such a great amount of work for Oriental entomology, and to whom I am personally indebted for a large number of Diptera from Ceylon.

42. **Greenomyia nigricoxa**, sp. nov. (Pl. II, fig. 8; Pl. III, fig. 9.)

♂. *Head* quite black, except a little grey reflection on face; the yellow palpi and flagellum with a dark brown tinge. *Thorax* shining black, with a little greyish reflection here and there laterally, and behind the shoulders. Irregular black bristles over dorsum, stronger ones towards sides; two dorso-central ones on posterior margin. Scutellum narrow, black, with four stiff bristles on the hind margin; metapleuræ greyish, viewed from behind. *Abdomen* of six segments only, the 1st much broader; moderately shining black, cylindrical, rather robust, posterior margins of basal segments narrowly brown, hind margin of last segment emarginate above. Genitalia broad, black, semicircular; a pair of flattened black claspers, having the first joint broad, the second not obvious but presumably present, small, ending in two distinct thick short black tooth-like spines and two strong long slender spines on the inner side. *Legs*: fore coxæ and all the femora yellowish; posterior coxæ black; tibiæ brownish yellow; tarsi black. *Wings* very pale grey, nearly clear; a light brownish suffusion at tip extending inwards as far as the middle of the branches of the 4th longitudinal vein. Halteres yellow.

Length $2\frac{3}{4}$ millim.

Described from a single male in the Indian Museum from Phagu, 8700 ft., Simla district, 3. v. 07 (*Annandale*).

Genus ALLACTONEURA, *Meij.**

Allactoneura, de Meijere, Tijd. Ent. L, p. 201 (1907).

GENOTYPE, *A. cincta*, Meij., the original species.

Head in profile oval, frons arched, with depressed line in middle. Two distinct ocelli, remote from eye margins, and an indistinct middle ocellus. Eyes broadly oval, face but slightly arched. Antennæ 16-jointed, as long as head and thorax together, flagellar joints cylindrical, longer than broad, closely sessile. *Thorax* not deep, with setæ posteriorly, elsewhere with scales and with appressed pile, as has also the abdomen; scutellum with two long setæ at the apex. *Abdomen* somewhat depressed, slender, in both sexes seven-segmented, in the male with a forceps hidden under the 7th segment; in the female the 7th segment and the lamellæ are very small. *Legs*: coxæ long and robust: all tibiæ with several ranges of setæ; spurs strong; tarsal joints, particularly the metatarsi, with numerous setulæ. *Wings* narrow, without anal angle. Costal vein ends just before tip of wing; subcostal cross-vein present, some distance before tip of auxiliary vein, the latter ending at one-third of the wing. The 1st longitudinal vein nearly straight, the 3rd begins near the subcostal cross-vein at a very acute angle, nearly longitudinal, the basal portion in a straight line with the rest of the vein. Anterior cross-vein placed transversely, that is to say, upright, near middle of wing, a little before the fork of the 4th longitudinal vein. Marginal (presumably) cross-vein present, joining the 1st and 3rd longitudinals, placed nearly opposite the fork of the 4th vein.† The 5th vein forks at extreme base of wing, the branches detached; the 6th and 7th veins are absent, but a fold in the wing behind the 5th vein (generally very distinct) appears, unless very closely examined, like a 6th vein.

Range. *A. cincta*, the only known species, was recorded originally from Java, but it seems widely distributed in the East.

Life-history unknown.

43. Allactoneura cincta, *Meij.* (Pl. I, fig. 17.)

Allactoneura cincta, de Meijere, Tijd. Ent. L, p. 202, pl. V, figs. 2, 3.

♂ ♀. *Head*: vertex black, frons blackish, remainder of head reddish yellow or dirty brownish with blackish hairs; palpi the same: antennal scape and about the basal third of the flagellum,

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* The description of the veins in *Allactoneura* is by the present writer, the other characters being taken from de Meijere.

† It is curious that de Meijere does not mention the very distinct (although yellow, in contradistinction to the dark brown anterior veins) cross-vein between the 1st and 3rd longitudinal veins, placed nearly opposite the fork of the 4th vein. Over a score of specimens have been examined by me and it is distinctly obvious in all, if looked for; also in an example identified by de Meijere himself. It will presumably be the marginal cross-vein, but is not always easily seen, from a prevailing tendency in this species for the wing to curl up.

more or less yellowish, rest of flagellum black, antennæ as long as the head and thorax together. *Thorax* blackish, with very minute black setæ, that in certain lights appear as a dull silvery sheen, lateral bristly hair stronger. Sides of thorax, scutellum and metanotum black, scutellum with two long apical curved bristles that cross one another. *Abdomen* black, with a narrow basal whitish band on the segments, very variable in its nature and sometimes practically absent. Genitalia of male prominent below the last segment of the abdomen, with two nearly straight claspers, which have black hairs on the underside and on the innerside are provided with hook-shaped tips ; of female very small, yellowish. *Legs* pale whitish yellow ; coxæ very large, a little black at base and tip ; femora with the fore pair only a little black at tip, middle pair broadly black-tipped and hind pair wholly black or nearly so ; tibiæ and tarsi blackish, the latter the darker, tibial spurs yellowish, innerside of fore tibiæ pale yellowish ; the tibiæ of three very unequal lengths : the fore pair quite short, the middle pair distinctly longer but relatively short, the hind pair of normal size compared with other genera in this family. *Wings* pale grey, broadly blackish at tip, the colour covering about the apical third, the depth of shade and the extent varying. Venation in accordance with the generic description.

Length 5 millim.

Described (the female only) from several of that sex in the Indian Museum from Sylhet, 1. i. 5 (*Lt.-Col. Hall*) ; Thamaspur, Nepal, 18–20. ii. 08 ; Peradeniya, Ceylon, 10–30. vi. 10 and 15. viii. 10 (both *Gravely*) ; Semarang, Java (named by de Meijere), ii. and iii. 06 (*Jacobson*). In my collection from Peradeniya, Ceylon, ix. and xii. 09 (*Green*).

The description, so far as it applies to the male only, is incorporated from Dr. de Meijere's description as I have not seen a male myself. The author of the species says the sexes are alike, except that in the female the last abdominal segment is shorter than the preceding and is dark brown. He also observes that this species must be akin to *Mycetophila obscurata*, Walk., described from Salawatti.

The black body, yellowish white, black-tipped coxæ and anterior femora, and wholly black hind femora, reddish face and base of antennæ, and smoky tips to the wings, make the species a conspicuous one. The wings show a great tendency to fold up in all the specimens I have seen.

Genus **ODONTOPODA**, *Aldr.* (Pl. I, fig. 16.)

Odontopoda, Aldrich, Rep. Geol. Indiana, xxi, p. 187 (1898).
Proanaclinia, Meunier, Monog. Mycetoph. p. 145 (1904).

GENOTYPE, *O. sayi*, Aldr.

Head : ocelli three, all large, placed nearly in a straight line ; antennæ 16-jointed, the two basal joints differentiated, those of the flagellum cylindrical, the 1st flagellar joint the longest. Palpi

four-jointed, 1st joint short, 2nd a little longer, 3rd longer than the two preceding, 4th a trifle shorter; coxæ elongated. *Abdomen* of the male long, slender, clavate, composed of seven distinct segments besides the hypopygium. *Wings* elongate oval. Costal vein ending at tip of 3rd vein; auxiliary vein long, ending near middle of wing; 1st longitudinal practically straight, long; 3rd longitudinal beginning before middle of wing in a bold curve, considerably bisinuate afterwards, anterior cross-vein situated near its base. The 4th longitudinal forked before its middle, anterior branch indistinct at base; 5th vein widely forked below or just beyond anterior cross-vein; 6th vein incomplete.

Range. United States (Indiana) and Sikkim; also in Baltic amber.

The above (except the wings) is from Johannsen (Gen. Ins.), and I assume it to be a copy of Aldrich's original description, which is not accessible to me. Johannsen thinks the genus may possibly be synonymous with *Neuratchia.*

44. **Odontopoda indica**, sp. nov.

♂. *Head*: vertex blackish, face brown, underside of head and the palpi yellow; antennal scape and base of 1st joint of flagellum yellow, rest of flagellum brown. *Thorax* yellowish brown, with short yellow hairs and stiffer bristly hairs around the margins; pleuræ with a slight violet tinge. (Scutellum and metanotum damaged.) *Abdomen* blackish, of seven elongated, subcylindrical segments with yellowish grey pubescence. Genitalia very large, bulbous, blackish brown, hairy and bristly, with a ventral plate. *Legs* yellowish; tarsi barely darker. *Wings* pale greyish, highly iridescent, base of upper branch of 4th longitudinal vein indistinct; halteres yellow.

Length 3¼ millim.

Described from a single male in the Indian Museum taken by me at Darjiling, 6000 ft., 1. x. 08.

The middle ocellus is not visible, owing to a slight crushing of the top of the head; it may or may not be present. Otherwise, except the slight damage to the scutellum and metanotum caused by the pin, the specimen is perfect. Only three species are known—two fossil ones from Baltic amber, and the third from Indiana, U.S.A.; it is therefore interesting to find the genus in the Himalayas.

Genus **ANOMALOMYIA**, *Hutton*. (Pl. II, fig. 6.)

Anomalomyia, Hutton, Index Fauna Nov. Zeal. p. 134 (1904).
Anomala, Marshall (*nec* Stephens), Trans. New Zeal. Instit. xxviii, p. 293 (1896).

GENOTYPE, *Mycetophila guttata*, Hutton.

Head moderate, nearly round, but slightly prolonged posteriorly, situated rather deep in the thorax. Eyes ovate, entire; ocelli two or three; if only two are present, one is situated in the margin

of each of the compound eyes; if three, the third in the middle of the front. Palpi short, incurved, four-jointed; 1st joint short, moderately robust, 2nd much longer, 3rd and 4th more slender and about equally long. Antennæ cylindrical, tapering toward the apex, projecting forward, arcuated, 16-jointed; 1st joint of scape nearly cylindrical, 2nd cupuliform, both joints setiferous on the sides and on the upper edge; flagellar joints cylindrical, with a short downy pubescence. *Thorax* highly arched; scutellum semicircular. *Abdomen* rather flattened, broadest in the middle. *Legs* rather short; tibiæ spurred and provided with lateral spines, which are short on the anterior tibiæ, and long ones arranged in three ranges on the intermediate, and two ranges on the posterior tibiæ. *Wings* with anal angle and tip rounded, the costal vein ending a little before the tip. Auxiliary vein rather long, reaching nearly to the middle of the wing; 1st longitudinal curved gently upwards, ending a little beyond middle of wing; 3rd begins at a right angle (like a cross-vein) from near the tip of the 1st: it is therefore short, and after the bend runs straight to the wing-border. Anterior cross-vein very oblique, rather long, in a line with the major portion of the 3rd vein; 4th longitudinal forked widely near border of wing; 5th forked widely at half its length; 6th short, indistinct.

Range. New Zealand (two species) and Eastern Himalayas.

Life-history unknown.

45. **Anomalomyia indica**, sp. nov.

♂. *Head* black above; ocelli placed towards centre of frons, middle one smaller and lower. Head below antennæ yellow. Antennal scape and base of 1st joint of flagellum yellow; rest of flagellum blackish brown, with pale pubescence. *Thorax*: dorsum brownish yellow; two median narrow black stripes from anterior to posterior margins, a shorter wider one on each side on the hinder two-thirds of the distance. Surface with small bristles of different lengths, more or less in longitudinal rows; lateral margins with larger different-sized ones irregularly placed, but there are four or five strong spiny bristles in a row below the shoulders, a row of three in front of the base of the wing, several supra-alar ones, two strong ones at each posterior corner, and two dorso-central large ones between these pairs. Scutellum yellow, with four large curved bristles. *Abdomen* black, 6-segmented, with sparse short pubescence, moderately broad. Genitalia small, dark brown, pubescent, apparently consisting of a pair of short thick claspers (the second joint of which is not visible) and a small dorsal plate. The genitalia are mainly concealed, but there is a conspicuous, almost erect, bright yellow, narrow, ventral plate, above which can be seen the palp-like tips of a pair of organs. *Legs*: coxæ yellowish; femora black, except apical half of fore pair, and tip of hind pair yellowish; fore tibiæ yellowish, posterior tibiæ brown, tibial spurs strong, yellowish white; tarsi dark brown. *Wings* pale yellow,

veins dark brown, distinct, anal vein not apparent; a brown suffusion at tip of wing, just beyond the forking of the 4th vein. Halteres pale yellow.

Length 3 millim.

Described from a single male in the Indian Museum, taken by Mr. Paiva at Darjiling, 7. viii. 09.

Genus **ACRODICRANIA**, *Skuse.*

Acrodicrania, Skuse, Proc. Linn. Soc. N. S. Wales (2) iii, p. 1194 (1888).

GENOTYPE, *A. atricauda*, Skuse; by original designation.

Head ovate, fore part flattened, situated deep in the thorax; front broad, the anterior margin produced into a small triangle reaching the basal joints of the antennæ; eyes oval; ocelli three, of unequal size, arranged in a line on the front. Palpi prominent, incurved, four-jointed; 1st and 2nd joints robust, short, the 2nd about twice the length of the 1st; 3rd joint much more slender and a little longer than the 2nd; 4th joint very slender, not the length of the 2nd and 3rd taken together. Antennæ cylindrical, projecting forwards, arcuated, about as long as or somewhat longer than the thorax, 16-jointed; 1st scapal joint cyathiform, about twice the length of the 2nd, the latter cupuliform, both with short setaceous hairs at the apex; the 2nd joint generally with only one strong seta; flagellar joints cylindrical, with very short downy pubescence. *Thorax* ovate, highly arched; scutellum nearly as wide as the thorax, too flattened to be semicircular; metathorax highly arched. *Abdomen* rather robust; eight segments, the eighth very short and generally hidden by the seventh; in the male flattened, claviform, with a moderate anal joint and forceps; in the female robust, flattened, terminating in a short ovipositor provided with two small terminal lamellæ. *Legs* strong; femora broadly flattened; tibiæ spurred, and having strong lateral spines on the intermediate and hind pairs; fore tibiæ with a range of minute spines on the outer and inner side, the spines on the latter widely separated and few; intermediate tibiæ with three ranges on the outer side and one on the inner side; hind pair with two ranges on the outer side. *Wings* longer than the abdomen, moderately broad, with rounded-off base; microscopically pubescent. Venation with rather an abnormal appearance. The auxiliary vein short, ending in the costa at one-third of the wing, with the subcostal cross-vein distinct, near its tip. The 1st longitudinal nearly straight, ending at middle of wing; 3rd vein originating from near tip of 1st vein, at a right angle (like a cross-vein), slightly bisinuate, short. Anterior cross-vein long, oblique, forming with the 3rd vein (after the bend) a bisinuate line. The 4th vein forked widely some distance beyond contact with anterior cross-vein, the 5th widely forked before half its length, the branches a little sinuous, the upper one detached at its base. The

6th vein long, but ending far from border of wing; the 7th very short, indistinct.

Range. The only four known species are from Australia.

Froggatt considers the genus a synonym of *Leia*.

The two species referred here with some doubt to this genus are distinguished easily thus :—

Thorax unicolorous, unmarked .... *ferruginea*, sp. n., p. 93.
Thorax with a large oval black spot towards each side of the dorsum .... *incerta*, sp. n., p. 93.

46. (?) **Acrodicrania ferruginea**, sp. nov.

? ♀. *Head* orange-yellow. Eyes ovate. Palpi orange-yellow, apparently four-jointed; 1st short, 2nd and 3rd long, the former the widest of all, 4th short, but the demarcation of the joints not very obvious. Antennæ with the scape and basal half of flagellum reddish orange, apical half of flagellum blackish. *Thorax* orange-yellow, highly arched, microscopically pubescent. Scutellum (damaged by pin) nearly as wide as thorax, short, blackish; metanotum blackish. *Abdomen* black, closely but shortly pubescent; apparently only 6-segmented, though a seventh may be easily concealed below the last one; segments towards the base more or less dark brownish yellow; belly similarly coloured. *Legs* orange-yellow, a little tinged with brown. Femora blackish towards tips; middle and hind tibiæ with two rows of short setæ, which are longest on the latter. (Fore tibiæ missing.) Posterior tibiæ with long pale yellow spurs, tarsi a little darker. *Wings* pale yellowish-grey. Venation mainly as in Johannsen's figure (Gen. Insect., Fasc. 93, pl. 5, fig. 14), but the base of the 4th vein and the anterior cross-vein, with the 3rd vein, are all of them more in a straight line; whilst the petiole of the 2nd posterior cell is not a strong vein as shown in the author's figure, but is as weak as the branches forming the fork.

Length 3 millim.

Described from a single specimen (which appears to be a female, although no genital organs are visible) taken in the Khasi Hills, Assam, 1000–3000 ft., x. 06.

Type in the Pusa Collection.

This species is referred doubtfully to *Acrodicrania*, as some discrepancies are noticeable. The head is not sunk in the thorax; the abdomen has six, at most seven segments, not eight, as in Skuse's description.

47. **Acrodicrania incerta**, sp. nov.

♀. *Head* pale yellow, with pale yellow pubescence; vertex a little darker. Proboscis obtusely conical, pale yellow; palpi pale yellow. Antennal scape pale yellow; 1st joint moderately long,

a little broader at the tip, with a circlet of bristles; 2nd joint cup-shaped, with a row of bristly hairs near the tip. The first few joints of the flagellum yellowish, gradually darkening to black (at about the 5th joint), the remainder wholly black, the whole flagellum with whitish pubescence. *Thorax* shining light brownish-yellow; towards each side a very large elongate oval shining black spot, occupying about two-thirds the length of the dorsum, separated by a moderately broad space. The whole dorsum with rather long stiff yellow hairs. Scutellum blackish, broadly yellow along the whole base, posterior margin with four very long yellow bristles. Metanotum and pleuræ blackish. Sides of thorax yellowish. *Abdomen*: the 1st segment pale yellow, the remainder blackish, with pale pubescence on dorsum and longer yellow hairs along the sides. Belly black, with yellow hairs, yellowish at base. Of the genitalia two rather large blackish lamellæ are visible, with stiff bristly hairs at their tips. *Legs* wholly pale yellow, except the tarsi which are a little darker, and there is a trace of blackish colour about the trochanters. *Wings* pale yellowish grey, a little more yellowish on the basal anterior part. Veins brownish yellow, venation normal.* Halteres missing.

Length $2\frac{1}{2}$ millim.

Described from a single female taken by Dr. Annandale at Kurseong, 20. vi. 10.

Type in the Indian Museum.

The yellow thorax and large black side-spots make this species appear very like *Leia arcuata*, Brun., but the absence of the conspicuous arcuate blackish stripe on the wings at once distinguishes it.

Genus **CLASTOBASIS**, *Skuse*. (Pl. II, fig. 5.)

Clastobasis, Skuse, Proc. Linn. Soc. N. S. Wales, (2) v, p. 617 (1890).

Genotype, *C. tryonii*, Skuse; by original designation.

Head roundish, flattened in the fore part, situated deep in the thorax; front broad, the anterior border produced triangularly, the point between the joints of the scapus; vertex high; eyes oval; ocelli large, the middle one smaller, situated almost in line with, but somewhat behind the other two. Palpi prominent, four-jointed; 1st joint small, 2nd tolerably long and robust; 3rd a little longer than the second, more slender; 4th very long and slender, about equal in length to the 2nd and 3rd combined. Antennæ slender, porrected, arcuated, 16-jointed; 1st joint of the scapus obconical, longer than the second, the 2nd cupuliform, both setiferous at the apex; flagellar joints cylindrical, progressively diminishing in thickness, with minute downy pubescence.

* The venation agrees with the figure of the wing given by Johannsen (Gen. Insect., Fasc. 93, pl. 5, fig. 14).

Thorax ovate, highly arched, hairy; lateral border setiferous; scutellum lunate, setiferous; metanotum large, acclivous. *Abdomen* of the female seven-segmented, narrowed at the base and towards the extremity; ovipositor short, thick, inconspicuous. *Legs* long and slender; intermediate and hind femora moderately broad; tibiæ spurred, and with lateral spines; fore pair with some minute spines along the outer side; intermediate pair with two sparse rows of long spines on the outer and some very small spines on the inner side; hind pair with two sparse rows of very long spines and a row of very short spines on the outer side; in the hind legs the tibiæ and tarsi of about equal length. *Wings* a little longer than the entire body, moderately broad, with rounded-off base, microscopically pubescent. Costal vein ending at tip of 3rd vein, some distance before tip of wing; the auxiliary vein moderately long, ending free and indistinctly, not turning either up or down. The 1st longitudinal vein only of moderate length, ending at middle of wing; the 3rd beginning at about the middle of the wing near the tip of the 1st, and at a right angle, giving the appearance of a cross-vein. The 4th vein forked about the middle of the wing, soon after contact with the anterior cross-vein, which is long, very oblique, and in a line with the main portion of the 3rd vein; 5th vein forked near base, the upper branch interrupted at its base; 6th and 7th veins incomplete, the former long, the latter very short.

Range. Only one species previously known, *C. tryonii*, Skuse, from Australia; Assam.

48. **Clastobasis vittigera**, sp. nov.

♀. *Head* wholly bright yellow. Vertex high, flat; frons perpendicular, pointed in front. Antennæ with short greyish pubescence; eyes microscopically pubescent, mid ocellus absent, lateral ones very large and conspicuous. A row of eight or nine yellow, curved bristles behind each eye, and four long yellow ones behind vertex, curving slightly backwards; a few on the frons. *Thorax* wholly bright brownish yellow. A few stiff bristly yellow hairs laterally, but no obvious chætotaxy. (Scutellum and metanotum destroyed by pin.) *Abdomen* yellowish; a dark brown band on posterior part of each segment, broadest in the middle, nearly covering the dorsum of the 5th and 6th. Genitalia inconspicuous. *Legs* wholly bright yellow; tarsi barely darker. *Wings* yellowish; a slight brownish yellow suffusion on the disc towards tip; 4th and 5th longitudinal veins not quite reaching margin. Halteres yellow.

Length 3 millim.

Described from a single male from Sadiya, N.E. Assam, in the Indian Museum.

There is no reasonable doubt of the species belonging to *Clastobasis*, the only discrepancy, compared with Skuse's description, being the absence of the middle ocellus. It agrees perfectly with

the diagram of the wing. The only other species known is *C. tryoni*, Skuse, from Australia. I retain the manuscript name given to the species by Bigot, though the applicability of it is not very clear unless the row of bristles around the back of the head is referred to.

Genus LEIA, *Mg.*

Leia, Meigen (part.), Syst. Besch. i, p. 258 (1818).
Lejomya, Rondani, Dipt. Ital. Prod. i, p. 195 (1856).
Lejosoma, Rondani, *op. cit.* corrig.
Glaphyroptera, Winnertz, Verh. zool.-bot. Ges. Wien, xiii, p. 781 (1863).
Neoglaphyroptera, Osten Sacken, Cat. Dipt. N. Amer. p. 10 (1878).

GENOTYPE, *L. fascipennis*, Mg.; by designation of Curtis (British Entomology, p. 645).

Head with elevated vertex, oval, flattened in front, placed low upon the thorax; eyes elongate oval, somewhat emarginate at the base of the antennæ; ocelli three in number, placed in a curved line upon the broad front; the laterals large, rather close to the eye-margin, though not contiguous; the middle ocellus smaller. Palpi large, incurved, four-jointed; the 1st joint smallest, the 4th as long or longer than the preceding. Antennæ projecting forward, 16-jointed; the two basal joints differentiated, setose at the apex; the flagellar joints cylindrical, somewhat compressed, short pilose. *Thorax* oval, highly arched; scutellum small, nearly semicircular in outline; metanotum high, steep; halteres small. *Abdomen* seven-segmented, slender; in the male cylindrical, and with small forceps; in some forms the seventh segment is reduced and nearly hidden by the sixth sclerite; in the female flattened and ending in a short ovipositor with two small lamellæ. *Legs* moderately strong, all tibiæ with spurs and lateral setæ; fore tibiæ with a range of delicate setæ on the flexor and another on the extensor surface; there are also several scattered setæ; middle tibiæ with one range of delicate setæ and a single prominent one on the flexor surface, two ranges of rather stout setæ on the extensor surface, a single seta between the latter near the apex, and three or four setæ in an irregular row near the range on the flexor surface; hind tibiæ with a range of delicate setæ on the flexor surface and two ranges of stout setæ on the extensor surface, besides several smaller scattered ones. *Wings* somewhat longer than the abdomen, elongate oval, with rounded base. The costal vein ends at the tip of the 3rd longitudinal vein, not far from the wing-tip; the auxiliary vein is short, ending at one-third of the wing. The 1st longitudinal ends at a little beyond the middle, with the subcostal cross-vein near the tip of the auxiliary. The 3rd vein begins near the tip of the 1st at a right angle, the anterior cross-vein long and oblique, placed at the deflection; the 4th vein forked a little beyond the anterior cross-vein, the 5th vein widely forked before the fork of the 4th vein; 6th and 7th veins incomplete, the former rather strong. In

some species the upper branch of the 5th vein is slightly disconnected at the base, and the prongs of both the 4th and 5th veins may be nearly parallel or distinctly divergent according to the species.

Range. Europe, North Africa, North and South America, West Indies, India, and Sumatra.

Life-history. The larvæ live in fungi, but beyond this nothing appears to be known.

"The name *Leia* replaces *Neoglaphyroptera* because Curtis designated *L. fasciatipennis*, Meigen, as the type and because Rondani, the first reviser of the genus, defines it as above. It appears that the name *Leja* was used by Dejean for a genus of Coleoptera. Scudder dates it 1821 and credits it to Megerle. Lacordaire states that it was used by Dejean in his first catalogue which, according to Hagen, appeared in 1802. As this catalogue is not accessible to me I am unable to decide the question of synonymy; the spelling being different it may be justifiable to use the name *Leia* even should it be antedated by *Leja*; if not, it must be replaced by *Lejomya*, Rondani." *

Table of Species.

1.	Yellow species, with or without markings.	2.
	Shining black species; wing-tip infuscated	6.
2.	Thorax with three black stripes	3.
	Thorax never striped	4.
3.	Wing with three black spots	*winthemi*, Lehm., p. 97.
	Wing with only one black spot	*flavobrunnea*, sp. n., p. 99.
4.	Thorax with a very large black spot towards each side; wing with an arcuate blackish mark towards the tip .	*arcuata*, sp. n., p. 99.
	Thorax without such spots	5.
5.	Thorax wholly yellow; wing with a blackish transverse streak near tip	*bicolor*, sp. n., p. 100.
	Thorax shining black except on anterior margin; wing with a very narrow arc-shaped blackish streak near tip	*insignis*, sp. n., p. 101.
6.	Front coxæ dark, hind femora brownish; proboscis not spatulate	*nigra*, sp. n., p. 101.
	Front coxæ and hind femora pale yellow; proboscis spatulate	*spathulata*, sp. n., p. 101.

49. **Leia winthemi**, *Lehm.* (Pl. II, fig. 2.)

Leia winthemi, Lehmann, Ins. spec. in agro Hamb. captæ, p. 39 (1822).

Glaphyroptera winthemi, Winnertz, Verh. zool.-bot. Ges. Wien, xiii, p. 789 (1863).

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* The above quotation is from Johannsen (Gen. Ins., Fasc. 93, p. 76, 1909), and explains the question of synonymy concisely; it is therefore quoted verbatim.

Mycetophila maculipennis, Say, Long's Exped. St. Peters Riv., App. p. 365 (2) (1824).
Leia trifasciata, Walker, List Dipt. Brit. Mus. i, p. 93 (1848).

♂ ♀. *Head* yellowish, vertex light brown; palpi yellowish; antennal scape and the two or three basal flagellar joints yellowish, the remainder brown; scape with bristles at tip of each joint. *Thorax* brownish yellow, with three distinct dark brown stripes, well separated, the median one reaching the anterior margin and distinctly divided in front; the outer stripes shorter, but continued to the posterior margin. Scutellum yellow, brown in the centre. *Abdomen*: in male brownish yellow, posterior borders of segments with a broad dark brown band, varying in breadth and intensity, often narrower in the middle; in female nearly all black or blackish brown, or only the fore borders narrowly, or anterior angles of segments shortly pale; in both sexes with pale pubescence. Belly in male yellowish, in female blackish. Genitalia of male large and conspicuous, light brownish yellow; a large obtusely conical basal joint to the claspers, the second joint terminated by two large strong black claws, the basal joints united at their bases above. There is also a pair of bright yellow intermediate palp-like organs. Ovipositor of female apparently normal. *Legs* brownish yellow, tips of femora more broadly, tips of tibiæ rather narrowly black, the latter with three rows of setæ; tibial apical spurs long, reddish yellow; tibiæ a little blackish yellow, tarsi darker. *Wings* distinctly yellowish, a brown suffusion over the anterior cross-vein and petiole of 4th longitudinal vein, over the basal section of 3rd vein, and a longer spot from the costa just beyond tip of 1st longitudinal vein extending nearly to the anterior branch of the 4th vein, and another spot at tip of 3rd vein. Anterior cross-vein rather long, basal section of 3rd vein short, the vein originating towards tip of 1st vein. The 4th vein forks a little beyond the anterior cross-vein, the branches parallel; the 5th vein forks before the basal end of the anterior cross-vein, the branches diverging; 6th vein very short, indistinct, 7th moderately long, distinct.

Length 3–5 millim.

Redescribed from several specimens of both sexes in the Indian Museum from the following localities:—

Simla, 25. iv. 07, 5. v. 07, 10. v. 09, Matiana, Simla district, 28–30. iv. 07 (all *Annandale*); Naini Tal, 2. vi. 09, Darjiling, 5. viii. 09 (*Paiva*), 29. v. 10 (*Brunetti*); Ukhrul, Manipur (*Pettigrew*). The species also occurs in Sumatra, Europe, and North America.

Type. The location of this I have been unable to trace.

This species is apparently confined to the hills in eastern regions, though it is not uncommon throughout Europe. Van der Wulp in his "Catalogue of South Asian Diptera" records it from Mid-Sumatra, a female being taken on the Peak of Indrapoera almost identical with the European form.

50. **Leia flavobrunnea**, sp. nov.

♂. *Head* yellowish; three distinct, rather large, round black spots on frons, carrying the ocelli, the middle one of which is slightly smaller than the others and placed rather above them on the frons; each also carries a bristle, the outer ones being very large and conspicuous; all the rear part of the head behind the ocelli with short, stiff, bristly brown hairs; face and palpi yellowish, former with brown hairs. Antennal scape and first ten joints of flagellum yellowish, the remainder black. *Thorax* brownish yellow, with three darker brown stripes, the median one faint, formed of two narrowly separated fine lines, the outer ones pointed at each end; all three attain the hind margin of the dorsum, the middle one being continued over the concolorous scutellum, which bears four bristles on its hind margin. Metanotum brownish yellow, with a pair of longitudinal blackish stripes; sides of thorax concolorous. *Abdomen* black on dorsum, pubescent; base pale; belly yellowish, except at the tip. Genitalia subglobose, yellowish, apparently twisted sideways; the basal joints obtusely conical, with a pair of intermediate small black horny hook-like appendages and an elongate narrow dorsal style. *Legs* brownish yellow, tibiæ a little darker, posterior tibiæ beset with bristles. *Wings* yellow, a little paler behind; venation normal, veins yellow or yellowish brown. A brown mark over the tip of the 3rd longitudinal vein, extending a little in front of the vein at the margin of the wing, and a little behind the vein at a short distance from the wing-margin. Halteres yellow, with a short thick stem, clubs black-tipped.

Length 3½ millim.

Described from one male taken by me at Darjiling, 29. v. 10.

Type in the Indian Museum.

51. **Leia arcuata**, sp. nov. (Pl. II, fig. 3.)

♂ ♀. *Head*: frons rather bright yellow, reddish or brownish on vertex; face and palpi light brownish yellow; antennal scape and about basal half of flagellum yellow, darkening gradually to blackish on the apical part. The three ocelli distinct, black; some pale hairs on upper part of head and stiff black hairs behind it; back of head reddish yellow. In some females nearly all the head is more or less uniformly yellowish. *Thorax* light brownish yellow, sides and scutellum concolorous, dorsum generally a little darker. Metanotum and metapleuræ wholly black. There is on each side of the dorsum a very large, pear-shaped, shining, jet-black spot, extending from a little below the shoulders to the posterior corners, and from the wing-roots nearly to the middle of the dorsum, leaving only a narrow yellow interval between the two spots. Thorax covered with loose shaggy yellow hairs, amongst which there are several bristles along the lateral borders of the dorsum, strongest above the wings; two dorso-central

bristles, and the scutellum bears a strong one on each side, nearly as large as the apical pair. *Abdomen* yellow, with light yellow pubescence; 1st segment wholly black, the rest with a broad black posterior margin (which is generally narrowest on the 2nd segment); in the male this band is more or less of regular width, but in the female it is generally enlarged in the middle to a sufficient extent to attain the base of each segment, in some specimens the colour spreading over the whole of the hinder segments. Belly yellowish, blackish towards tip. Genitalia of male yellow, of moderate size, second joint of claspers very slender; in the female the organs are inconspicuous, yellow. *Legs* wholly yellowish, tibiæ rather darker, tarsi blackish. *Wings* yellowish grey; an irregular, ill-defined, but distinct brownish arcuate band (its convexity inwards) towards tip, crossing the 3rd and both branches of the 4th longitudinal vein, and touching the tip of the 5th at the wing-border. Halteres pale yellow.

Length 3 millim.

Described from two males and ten females in the Indian Museum, from Kurseong, Darjiling District, 5000 ft., 3–9. vii. 08, 26. vi. 10; and Naini Tal, West Himalayas, 10. vi. 09. A specimen in the Pusa Collection is from the Khasi Hills, Assam, 1000–3000 ft., iii. 07.

A very conspicuous species, and easily recognised from all others in the genus or even subfamily, by the very large shining black spots on the thorax. In one specimen from Bhowali, Kumaon, taken by Mr. A. D. Imms in July 1909, the basal half of the hind femora is black and the wing-marks almost absent. Mr. Imms took it again at Bhowali on 28. vi. 10.

52. **Leia bicolor**, sp. nov.

♀. *Head*: frons and vertex reddish yellow; face and palpi ight brownish yellow; antennæ with the first few joints of flagellum bright reddish yellow. (Remainder missing.) *Thorax* brownish yellow, traces of three narrow brown stripes converging, but not uniting, towards posterior margin. Sides, pleuræ, scutellum, and metanotum concolorous. Dorsum with two distinct rows of dorso-central small bristly hairs, of irregular size, and two stronger bristles on each posterior corner, also a curved row of four strong ones on the scutellum. Metapleuræ with numerous long stiff yellow hairs. *Abdomen* wholly black, very narrowly yellow at base, with a few pale hairs. Belly blackish; genitalia concealed. *Legs*: coxæ and femora reddish yellow, tibiæ blackish yellow, tarsi blackish. *Wings* rather deeply yellowish; a brownish band near tip, crossing the 3rd longitudinal, and both branches of the 4th longitudinal vein. Halteres yellow.

Length $4\frac{1}{2}$ millim.

Described from a single female in the Indian Museum, taken by Dr. Annandale at Kurseong, 7. ix. 09.

53. **Leia insignis**, sp. nov.

♀. *Head*: frons and vertex black, with pale hairs. Antennæ set in well-marked, large cavities, the edges of which are pale yellow. Scape yellow; flagellum brown, a little paler beneath at the base. Underside of head and the palpi pale yellow. *Thorax*: dorsum wholly shining black, but leaving a broad yellow anterior margin; the shoulders, humeri and the anterior part of the sides also yellow. Metapleuræ, metanotum and the mesopleural region black. Scutellum yellow, with a row of four strong yellow bristles. Dorsum of thorax with yellow hairs, amongst which can be distinguished a more or less distinct pair of dorso-central rows, which end in a pair of strong yellow bristles. Other strong yellow bristles occur laterally in the usual situations, but some of them can hardly be strictly differentiated from the stiff hairs which are irregularly placed around the edges of the dorsum and elsewhere. *Abdomen* yellow, with sparse, short yellow hairs; hind margins of segments with a broad black band, which is narrowest on the 1st segment, and which shows a tendency to increased width in the middle in the others. Last segment, belly and genitalia all yellow, latter small. *Legs* yellow, tibiæ scarcely darker; tips of hind femora very narrowly black, tarsi blackish. *Wings* pale yellow, an indistinct narrow, transverse streak towards the tip. Halteres yellow.

Length 3 millim.

Described from a single specimen from Ukhrul, Manipur, 6400 ft., in the Indian Museum.

54. **Leia nigra**, sp. nov. (Pl. II, fig. 4.)

♀. *Head* black, except the greyish face and pale yellow palpi. *Thorax* wholly black, pubescent; dorsum moderately shining, with strong hairs, and with some bristles laterally, on the anterior corners and humeri and on the posterior corners; the scutellum also bears a row of four strong bristles. *Abdomen* black, pubescent. Genitalia black; a cylindrical, hairy piece and a ventral plate are visible. *Legs* black; tibiæ pale brownish yellow, apical spurs white (middle tibiæ in the second specimen brownish towards tip). *Wings* pale grey, tip brownish, the colour extending to about the middle of the branches of the 4th longitudinal vein and the tip of the 5th.

Length 3 millim.

Described from two examples in the Indian Museum, from Naini Tal, 2. vi. 09 (*type*), and Simla, 9. v. 09 (*Annandale*).

55. **Leia spathulata**, sp. nov.

♂. *Head*: vertex, frons, and face all black, with microscopic grey pubescence, the face with grey reflections when viewed from above; vertex and frons with, in addition, stiff bristly black hairs.

Ocelli yellowish white. Proboscis comparatively elongate, with very broad and long labella, pale yellow with blackish marks on the upper side; palpi yellowish white. Antennæ black, with microscopic grey reflections. *Thorax* shining black, rather densely covered with black bristly hairs of different lengths; whitish grey on the shoulders, the colour extending laterally as far back as the wings. Scutellum, metanotum and sides of thorax black; pleuræ slightly dusted with grey. *Abdomen* black, pubescent; posterior margins of segments yellow on underside, the colour extending narrowly to the upper side of some of the basal ones. Genitalia large, rounded, shining black, pubescent; an obtusely conical 1st joint and, apparently, some smaller intermediate appendages. *Legs* pale yellow, posterior coxæ black, tarsi pale blackish yellow; posterior tibiæ spinose, apparently bearing three rows of rather large setæ; fore tibiæ with much shorter bristles. *Wings* very pale grey, blackish on about the apical fourth, the colour extending across the wings, limited proximally, nearly in a straight line, from the middle of the 3rd vein to the tip of the anterior branch of the 5th vein; the 6th vein distinct, straight, ending at about opposite the fork of the 5th vein. Halteres pale yellow, clubs oval.

Length $3\frac{1}{4}$ millim.

Described from one male taken by me at Darjiling, 25. v. 10.

Type in the Indian Museum.

It is questionable whether a new genus might not be established for this species, owing to the lengthened proboscis and highly developed labella. Agreeing, however, as it does with the other generic characters of *Leia*, and bearing a considerable resemblance to *L. nigra*, it seems advisable to refer it here for the present.

Genus **RHYMOSIA**, *Winn.*

Rhymosia, Winnertz, Verh. zool.-bot. Ges. Wien, xiii, p. 810 (1863).

Genotype, *R. fasciata*, Mg.; by designation of Johannsen (Gen. Ins., Fasc. 93, p. 102, 1909).

Head oval, vertex somewhat raised, front broad, narrowed anteriorly; eyes nearly circular, somewhat bulging; ocelli three in number, the laterals large, closely contiguous to the eye-margins, the middle one very minute, placed in a groove on the front, sometimes almost concealed. Palpi incurved, four-jointed, 1st joint very small, the 4th longer than the three preceding. Antennæ 16-jointed, basal joints differentiated, setose at the apex, the flagellar joints cylindrical, compressed, pubescent. *Thorax* oval, highly arched; mesonotum short-haired, usually only the margin with setæ; scutellum large, margin setose; metanotum high, steep. *Abdomen* of the male six-segmented, with small terminal segment and rather small forceps, that of the female seven-segmented, slender, constricted at the base, compressed, with short, stout ovipositor and a pair of terminal lamellæ. *Legs*

long and slender, tibiæ spurred and with slender lateral setæ. *Wings* oval, base rounded, about as long as the abdomen, with microscopic setulæ arranged in parallel longitudinal rows. Costa ending before tip of wing; auxiliary vein rudimentary. The 1st longitudinal vein straight, the 3rd beginning at its middle, mainly straight; anterior cross-vein oblique, placed before middle of wing. The 4th longitudinal forked immediately after contact with the anterior cross-vein, the branches nearly parallel, gently diverging; 5th vein forking before 4th, the branches diverging, 6th vein strong but incomplete, 7th short and indistinct.

Range. Himalayas, Bengal, Assam, Ceylon; previously recorded only from Europe and North America.

Life-history. Apparently little is known, but Winnertz states that *R. fenestralis*, a European species, breeds in *Agaricus melleus*. Johannsen says some species feed on *Armillaria*, a genus of fungi.

A character of many species of this genus is the narrow forking of the 5th longitudinal vein for a certain distance, after which the branches somewhat suddenly diverge, and it may be distinguished from such species of *Allodia* as have a narrowly forked 5th vein at the base, by the strong anal vein.

Table of Species.

1. Thoracic dorsum mainly blackish, margin yellowish	*flavolimbata*, sp. n., p. 103.
Thoracic dorsum mainly yellowish	2.
2. Thorax without distinct black stripes or marks	3.
Thorax with the three usual dark stripes	*genitalis*, sp. n., p. 104.
3. Antennæ with tip of each joint broadly black	4.
Antennæ uniformly brownish	*albolateralis*, sp. n., p. 104.
4. Thorax light yellowish, shoulders concolorous	*annulicornis*, sp. n., p. 105.
Thorax brownish yellow, shoulders distinctly paler	5.
5. Femora all pale yellow	*humeralis*, sp. n., p. 106.
Posterior femora with black streaks below towards tips	*fascipes*, sp. n., p. 106.

56. **Rhymosia flavolimbata**, sp. nov.

♂ ♀. *Head* bright reddish yellow, including antennæ, the tips of each joint of the flagellum very narrowly but distinctly black; vertex and back of head blackish. *Thorax*: dorsum very dark brown, with short pale yellowish hairs, margin of dorsum on three sides pale yellow, the hind margin blackish, except at the corners, which, with the scutellum, are yellow. Sides of thorax anteriorly reddish yellow; pleuræ and metanotum black. *Abdomen* black, moderately shining, with a few pale hairs. Genitalia of male very large, pubescent, brownish yellow, the large first joint of the

claspers followed by a comparatively short, obtuse dark brown, curved joint; a dorsal bifid plate, beneath which protrude two pairs of long almost filamentous appendages. Ovipositor of female very small, inconspicuous, concealed, yellow. *Legs* wholly pale yellow, except dark brown tips to coxæ and the darker blackish tarsi. *Wings* yellowish. Both branches of 4th vein distinct to the wing-border, nearly parallel; upper branch of 5th vein distinct nearly to its base. Halteres pale yellow.

Length 3 millim.

Described from two females (including *type*) taken by Dr. Annandale at Kurseong, 5000 ft., 4. vii. 08 and 21. vi. 10. I have seen it from Kumaon, 5700 ft., vii. 1909, taken by Mr. Imms.

Type in the Indian Museum.

57. **Rhymosia genitalis**, sp. nov.

♂. *Head* dark brownish yellow, with black pubescence, darker in centre. Face and proboscis bright yellow, two small lip-shaped labella at the tip of the proboscis; palpi with the first two joints dark brown, 3rd and 4th yellowish, thinner. *Thorax* bright yellowish, with the three usual darker broad stripes, the middle one attaining the anterior margin, where it is widened; all three attain the hind margin; dorsum covered with yellow hairs. Scutellum and metanotum blackish, underside of scutellum yellowish. Sides of thorax yellowish, pleuræ blackish. *Abdomen* black, hind margin of the basal segment brownish yellow. Genitalia very large and complex; a rather small oblong black dorsal plate, with two black palp-like appendages protruding from below; a very large shining black basal joint to the claspers, the 2nd joint being blunted and of irregular shape; two very long, pointed horny brownish yellow intermediate appendages, standing quite erect, above the level of the abdominal dorsum, and each terminating in three long slightly curved spines. *Legs*: coxæ and femora yellow, tibiæ a little darker, tarsi blackish. *Wings* yellowish, venation normal. Halteres yellow.

Length 3 millim.

Described from one male from Darjiling, taken by me, 29. v. 10.

Type in the Indian Museum.

58. **Rhymosia albolateralis**, sp. nov.

♂. *Head*: frons, face, palpi and scape bright yellow; base of 1st joint of flagellum pale yellowish white, remainder of flagellum light brown, pubescent; back of head black, a little reddish behind the eyes; eyes black, pubescent. *Thorax* brownish yellow, with microscopic black hairs, and two well separated rows of dorso-central black bristles; others occur around the lateral margins; three rather strong ones on each posterior corner, and two in the centre of the extreme posterior margin; a whitish streak on lateral margins of dorsum from shoulder to root of wing.

Scutellum concolorous, with two apical strong bristles, and a smaller pair immediately above them. Metanotum brownish yellow; pleuræ blackish. *Abdomen* yellowish, posterior half of each segment, and whole of last one, rich dark brown. The genitalia consists of a large hood-like pale yellowish piece, exteriorly pubescent, ending in two narrow prolongations; below this hood is a pair of bent claspers with long black hooks. *Legs* pale yellowish, tibiæ and tarsi darker. *Wings* pale brownish grey; halteres yellowish white.

Length $3\frac{1}{2}$ millim.

Described from a single male in the Indian Museum, from Naini Tal, 6000 ft., 10. vi. 09.

59. **Rhymosia annulicornis**, sp. nov. (Pl. II, fig. 10; Pl. III, figs. 13 & 14.)

♂ ♀. *Head* yellow, a little darker on vertex. Antennæ yellow, closely pubescent, apex of each joint of the flagellum with a broad black ring. A few bristles about the mouth; palpi varying from yellow to blackish. Back of head with bristles on the upper part, blackish on the lower part. *Thorax* yellow, slightly brownish yellow on dorsum, paler yellow at sides; dorsum with rather shaggy brownish-yellow hair; around the borders of the dorsum are several bristles of various sizes, the strongest being two curved ones in front of each wing base; there are at least two on each humerus, with others below them, two apparently notopleural; a strong one at each posterior corner, with two others of shorter and unequal lengths in front of them; and two dorso-central. Scutellum and metanotum yellow; former with two strong apical bristles. *Abdomen* of male yellow, posterior margins of segments narrowly black; belly yellow, with blackis posterior margins to segments. Abdomen of female yellow, or brownish yellow, with yellow pubescence; posterior margins of all segments with a black band, which is broadened in the middle, sometimes extending forwards to the base of the segment; last segment all yellow. Genitalia of male very conspicuous; each clasper formed of a large, short, emarginate, basal piece beyond which projects a prominent second joint attached to the first very narrowly and having the appearance of a ventral V-shaped plate with rounded edges, on the inner side of which are a row of strong black spines. On the upper inner side of the second joint is a small process ending in three black claws; a moderate-sized dorsal plate is present. In the female two small lamellæ are barely visible, the whole organ being totally withdrawn within the abdominal cavity. *Legs* pale yellow; tips of coxæ blackish, with some black bristles; extreme tips of femora sometimes black; apical spines on posterior tibiæ very large, dirty yellow; tibiæ and tarsi darker; posterior tibiæ with several strong bristles on hinder side and lesser ones on outer and inner sides. *Wings* yellowish,

veins brown, all bearing a microscopic row of bristles; lower branch of 4th longitudinal vein not reaching wing-margin; upper branch of 5th obliterated at base. Halteres pale yellow.

Length 3–3½ millim.

Described from one male and three females in the Indian Museum collection, from Madhupur, Bengal, 13. ix. 09, 15. x. 09 (*Paiva*); Calcutta, 18. vii. 08 (*Annandale*); and Peradeniya, Ceylon, 14–16. vii. 10 (*Gravely*).

60. **Rhymosia humeralis**, sp. nov.

♂. Considerably resembling *R. annulicornis*, the differences being as follows:—

Head with the vertex more blackish. *Thorax* with the dorsum rather darker brownish yellow and the anterior corners livid yellowish white; scutellum lighter; metapleuræ blackish. Bristles apparently similar but hardly as strong. *Abdomen* with the 1st, 4th, 5th, and 6th segments dark brown, with very narrow pale yellow hind margins; the 2nd and 3rd segments yellow; belly dark brown, posterior margins of all segments pale yellow.

Length 2¾ millim.

Described from a single male, from Sylhet, 3. ii. 05 (*Lt.-Col. Hall*); in the Indian Museum.

61. **Rhymosia fascipes**, sp. nov. (Pl. III, fig. 12.)

♂. *Head*: vertex black with coarse yellow hairs; a yellowish transverse ridge across the frons immediately above the antennæ, reaching from eye to eye. Face yellow, palpi brownish yellow. Antennæ brownish yellow, tips of all the flagellar joints dark brown. *Thorax* brownish yellow, with rather long yellow rough hairs, more bristly near the margins; anterior margin of dorsum and along the sides about as far as the wing, paler, yellowish grey; three indistinct broad darker brown stripes of the usual pattern are visible but not conspicuous. Scutellum yellowish, a little obscure on the dorsum; metanotum shining blackish brown, sides of thorax yellowish, pleuræ blackish, metapleuræ yellowish. *Abdomen* blackish; 1st segment mainly, 2nd on basal half, 3rd narrowly at base, yellowish; the whole abdomen with short yellow pubescence. Genitalia very complex; a narrow pointed dorsal style; a two-jointed pair of claspers, the 1st joint of moderate size, obtusely conical, the 2nd flattened, rather wide; an intermediate pair of fire-tong-like black horny processes, trisinuate, and ending in sharp points; they emerge from below the style and possibly spring from a single basal piece; below these, and almost below the large claspers also, is a second pair of appendages, ending in finger-like tips; except the black, tong-like processes, all the genital organs are brownish yellow with yellow hairs. *Legs* pale yellowish, tarsi barely darker, junction of

coxæ and femora dark brown on underside; hind femora dark brown near tip below, middle femora less so; posterior tibiæ with black tips, and bearing three rows of setæ. *Wings* yellowish grey, a little more yellowish on anterior border; tips of fork of 4th longitudinal vein converging, the lower branch incomplete. Halteres brownish yellow.

Length 3 millim.

Described from one male, from Peradeniya, Ceylon, 7. viii. 10 (*F. H. Gravely*).

Type in the Indian Museum.

Genus **ALLODIA**, *Winn.*

Allodia, Winnertz, Verh. zool.-bot. Ges. Wien, xiii, p. 826 (1863).
Brachycampta, Winnertz, *l. c.* p. 833.

GENOTYPE, *Mycetophila lugens*, Wied.; by Johannsen's designation (Gen. Ins., Fasc. 93, p. 104).

Head round, flattened in front, placed low upon the thorax, front broad; eyes round; ocelli three in number, the laterals large, contiguous to the eye-margins, the middle one very small, in a groove. Palpi incurved, four-jointed, the 1st small, the 4th longest. Antennæ 16-jointed, the basal joints differentiated, the flagellar joints cylindrical, pubescent. *Thorax* oval, highly arched; mesonotum with depressed hairs, only the margin setose: scutellum large, with marginal setæ. *Abdomen* of the male six-segmented, with complex forceps; the female abdomen with seven segments, slender, compressed, constricted at the base, with a short ovipositor, ending in two slender lamellæ. *Legs* long and slender, all tibiæ with long spurs and minute lateral setæ. *Wings* shorter or not longer than the abdomen, oval, with rounded base, and with microscopic setulæ arranged in parallel longitudinal rows. The costal vein ending some distance before the tip of the wing; auxiliary vein rudimentary; 1st longitudinal straight, long, 3rd beginning about its middle, also straight; anterior cross-vein moderately long, rather oblique; the 4th longitudinal forked before half its length, the branches gradually diverging; the 5th vein forks a little before the fork of the 4th, the branches diverging; the 6th and 7th veins incomplete, or more or less indistinct.

Range. Western Himalayas; and previously recorded from Europe and North America.

This genus is closely allied to *Brachycampta*, Winn., and that author distinguishes the two as follows:—In *Allodia* the first anal vein (6th vein), though short, is more or less distinct; in *Brachycampta* it is wanting; in the latter the fork of the 5th longitudinal vein is sometimes formed as in *Rhymosia*, the base of the fork being retracted before the proximal extremity of the anterior cross-vein, while in *Allodia* this is not the case.

However, with regard to these distinctions Johannsen says :—"These characters, while sufficient to separate most of the European species thus far described, fail utterly for some of the still undescribed North American forms, and for this reason the two genera are combined."*

62. **Allodia nigrofasciata**, sp. nov. (Pl. II, fig. 11.)

♂ ♀. *Head*: vertex dark brown or black, with grey pubescence; face blackish or brownish, rest of head including proboscis and palpi, yellow. Antennal scape and base of flagellum yellow, the rest black. Three or four strong bristles in a row behind upper inner corner of each eye. *Thorax* varying from reddish brown to black, with rather rough yellow pubescence, sides yellowish, pleuræ blackish, slightly dusted with grey. Bristles placed as follows :—several on the humeri of different lengths, three or four very strong ones below each humerus, some moderately strong ones on the anterior and lateral margins of dorsum, a powerful one on each posterior corner of dorsum, and smaller ones irregularly mixed with the soft yellow hairs covering the whole dorsum and along its posterior margin. Scutellum with two strong apical bristles. *Abdomen* compressed; varying from yellowish to dark brown and with soft pale hairs; dorsum with a broader or narrower black band on the base of each segment, sometimes occupying nearly all the surface, but leaving at least a narrow band on each hind margin, which widens towards the sides, over which the black colour extends for some distance basally. Genitalia of moderate size; the large basal joint of each clasper terminating in two narrow flexible finger-like appendages, and between the claspers a pair of branched black hook-like organs. In the female two narrow elongate yellow lamellæ are visible. *Legs* pale yellow, tips of femora, especially on hind pair, a little blackish; traces of a small dark streak below at base; tibiæ darker; tarsi blackish. *Wings* pale yellowish, iridescent; halteres yellowish white.

Length $2\frac{3}{4}$–$3\frac{3}{4}$ millim.

Described from two males and six females (including *type* ♂ and ♀) in the Indian Museum, from Simla, 10. v. 09 (*Dr. Annandale*); also from one from Mundali, Dehra Dun district, 9000 ft., 10–12. v. 10 (*C. W. Beebe*), in the same collection.

Types in the Indian Museum.

Genus **MACROBRACHIUS**, *Dzied.*

Macrobrachius, Dziedzicki, Hor. Soc. Ent. Ross. xxiii, p. 520 (1889).

Genotype, *M. kowarzii*, Dzied., the only previously known species; by original designation.

* Gen. Ins., Fasc. 93, p. 104 (1909).

Near *Phronia*. *Head* placed low down on thorax; palpi incurved, four-jointed, first two joints caliciform, 3rd joint cylindrical, 4th nearly as long as the first three taken together. Eyes oval, emarginate at base of antennæ; three ocelli, placed in a transverse line, the middle one small. Antennæ articulate, 16-jointed, scape differentiated, flagellum cylindrical. *Thorax* short, highly arched, metanotum short, scutellum small, with long setæ. *Abdomen* short and compressed, in male 6-segmented, in female 7-segmented. *Legs* strong; middle and hind tibiæ with two rows of lateral setæ on each. *Wings* oval, broader at base in the male; costa ending far beyond tip of 3rd longitudinal vein; auxiliary vein short, a little curved, the end free; the 4th vein forking beyond the basal section of the 3rd vein; the fork of the 5th longitudinal small, the fork, far beyond the fork of the 4th; branches widely diverging; the 6th longitudinal vein long and strong, but shortened; the 3rd vein beginning before the middle of the wing; the anterior cross-vein moderately long, very oblique, the 4th vein forking immediately after quitting it.

Range. Europe; Eastern Himalayas.

The long costa, in conjunction with the strong 6th vein, at once separates this genus from *Phronia*.

63. **Macrobrachius longicosta**, sp. nov. (Pl. III, fig. 11.)

♂. *Head*: vertex and frons black, with greyish pubescence; face very narrow, owing to the eyes being nearly contiguous just below the antennæ. Palpi pale yellow; scapal joints of antennæ bright yellow, each with a row of bristles; 1st flagellar joint yellow at base, the remainder brown, darkening nearly to black at the tip. Outer ocelli touching the eyes. *Thorax* bright brownish yellow, with very short golden yellow pubescence and numerous strong bristly hairs, which latter are more conspicuous towards the margins and along the middle, where they form two dorso-central rows; two brown, rather broad, longitudinal stripes beginning on the hind margin of the dorsum, but disappearing before reaching the middle. Prothorax with four strong bristles on each side. Scutellum sub-triangular, the upper corners rounded, blackish, with short yellow hairs and two divergent strong bristles at the tip; underside yellowish. Metanotum blackish, sides of thorax yellow, pleuræ blackish. *Abdomen* considerably compressed, six-segmented, black, with yellowish grey pubescence; belly yellowish. Genitalia yellowish; a short narrow emarginate dorsal plate, apparently united to the very large side-plates (unless these are the basal joints themselves of the claspers) and these meet below, forming a keel-shaped cavity for the inner organs, the tip prolonged narrowly as a ventral style, with three horny filaments. From the genital chamber project three tapering finger-like appendages, each ending in a horny hook; they are united at their bases and apparently form the second joint of the claspers, the first being hidden (unless they themselves are what are here described as

side-plates). Just above the style there are four strong spiny black bristles on each side-plate. *Legs* bright yellowish; tarsi blackish towards the tips. *Wings* pale yellowish grey, lighter around the posterior margin; venation in accordance with Johannsen's figure (Gen. Ins., Fasc. 93, pl. 6, fig. 12). Halteres blackish.

Length 3 millim.

Described from one male, from Kurseong, 25. vi. 10 (*Dr. N. Annandale*).

Type in the Indian Museum.

Genus **PHRONIA**, *Winn.* (Pl. II, fig. 9.)

Phronia, Winnertz, Verh. zool.-bot. Ges. Wien, xiii, p. 857 (1863).

Genotype, *P. rustica*, Winn.

Head round, flattened in front, placed low upon the thorax; front broad, the anterior margin produced into a triangle, the apex of which reaches to the base of the antennæ; eyes round; ocelli three in number, the laterals large, contiguous to the eye-margins, the middle one small, placed in a groove near the base of the frontal triangle. Palpi incurved, four-jointed, the 1st joint small, the 4th about as long as the 2nd and 3rd taken together. Antennæ in the male frequently, in the female usually, nearly cylindrical, slender, arcuate, 16-jointed, the two basal joints differentiated, the 2nd with setæ at the apex, flagellar joints cylindrical, slightly compressed, pubescent. *Thorax* oval, highly arched, mesonotum hairy, the hairs on the sides longer, no setæ; scutellum nearly semicircular, margin setose, metanotum high, somewhat arched. *Abdomen* of the male slender, six-segmented, compressed, constricted at the base, with rather large apical segment and forceps; female with seven-segmented abdomen, cylindrical, constricted at the base, with ovipositor ending in two lamellæ. *Legs* slender, fore tibiæ shorter than the corresponding tarsi; all tibiæ with spurs and lateral setæ. *Wings* oval, with a more or less rounded base, somewhat longer than the abdomen, microscopically setulose. Costa ending at varying points before the wing-tip, according to the species; auxiliary vein very short or rudimentary, ending free; 1st longitudinal moderately long; 3rd originating at a right angle before middle of wing, running straight to just above the wing-tip; anterior cross-vein short, 4th longitudinal vein forking soon after contact with the cross-vein, the branches gradually diverging; 5th vein forking beyond fork of 4th, the branches widely diverging; 6th and 7th veins incomplete, sometimes almost rudimentary.

Range. Sikkim, Assam; previously recorded only from Europe, and one species from Greenland.

Life-history. The early stages are passed in decaying wood.

To the student who would make this genus a special study,

Dziedzicki's elaborate monograph is recommended.* The flies are found in woods and among shrubs, usually in spring and autumn.

The two Oriental species described here may be separated thus:—

Yellowish species .... *simplex*, sp. n.
Blackish species............................. *semifumata*, sp. n.

64. **Phronia simplex**, sp. nov.

♀. *Head* yellowish, vertex brown, with whitish pubescence, antennæ light brown, scape and base of flagellum yellow. *Thorax* rather bright light brown, with microscopic pale pubescence, and a greyish reflection towards the lateral margins; three dorsal stripes very faintly indicated; lateral margins with stiff bristles. Scutellum concolorous, with signs of two broad darker stripes; two strong apical and two smaller subapical bristles. Metanotum and sides very light brownish yellow. *Abdomen* light brown, minutely pubescent, hind margins of segments narrowly pale yellow. Genitalia light brown, slender, with two elongated terminal lamellæ. *Legs* pale yellow, tibiæ and tarsi very pale brownish. *Wings* very pale yellowish grey; halteres pale yellow.

Length. 3¼ millim.

Described from a single example in the Indian Museum from Assam.

65. **Phronia semifumata**, sp. nov. (Pl. III, fig. 10.)

♂. *Head* black, with very short scattered grey hairs; proboscis blackish, tip brownish yellow; palpi yellowish. Antennal scape yellow, 1st flagellar joint pale brownish, remainder black. *Thorax* blackish; dorsum with short pale yellow hairs and strong brownish bristles around the margins; shoulders and upper corners of prothorax pale yellowish. Scutellum blackish, with four strong brownish spines. Metanotum, sides of thorax and pleuræ blackish, the latter with a little grey reflection. *Abdomen* black, compressed, with pale hairs. Genitalia rather large, rounded; a small dorsal bilobed plate and a ventral plate; the basal joint of claspers large, the 2nd joint consisting of three elongated appendages (which are not easily seen, being curled up on one another), one of which at least is covered with short bristles. *Legs*: fore coxæ pale yellowish, posterior coxæ blackish with grey reflections; femora and tibiæ pale yellow, tarsi blackish towards the tips. *Wings* yellowish grey, a little darker yellow on the anterior margin. Venation normal. Halteres pale yellow, clubs large, oval.

Length 3 millim.

Described from one male, taken at Tonglu, Darjiling district, 21. iv. 10 (*C. W. Beebe*).

Type in the Indian Museum.

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* Hor. Soc. Ent. Ross. xxiii. (1889).

Genus EXECHIA, *Winn.*

Exechia, Winnertz, Verh. zool.-bot. Ges. Wien, xiii, p. 879 (1863).
Parexechia, Becker, Insekten von Jan Mayen, p. 62 (1886).
Brachydicrania, Skuse, Proc. Linn. Soc. N. S. Wales (2) iii, p. 1215 (1888).

GENOTYPE, *Tipula fungorum*, de Geer; designated by Johannsen.*

Head roundish, compressed in the front part, situated deep in the thorax; front broad. Eyes longish-round; lateral ocelli large, closely contiguous to the eye-margins, middle ocellus either very small, placed in a groove on the front, or entirely wanting. Palpi incurved, four-jointed, 1st joint small, 4th longest. Antennæ projecting forward, somewhat arcuated, 16-jointed, 1st joint of the scape cyathiform, 2nd much shorter than the 1st, cupuliform, both setiferous at the tip; flagellar joints cylindrical, somewhat compressed, with minute downy pubescence. *Thorax* ovate, highly arched, with a short pubescence, setose on the lateral and hind borders; scutellum semicircular, setose, metanotum steep. *Abdomen* slender, in the male with six, in the female with seven segments, narrowed at the base, cylindrical or a little compressed; anal joint of the male rather large, forceps moderate or small; ovipositor of the female very short, with two small lamellæ. *Legs* long, slender, intermediate and hind femora rather broadly compressed, tibiæ spurred, and with lateral spines, fore pair with one distinct range of very minute spines on the inner side, and a few small spines along the outer side, intermediate pair with a range of small spines on each side, hind pair with two ranges of rather longer spines on the extensor surface; plantæ of metatarsus of hind tarsus with minute setulæ. *Wings* shorter than, subequal to, or a little longer than the abdomen, oblong oval, with rounded base, and with microscopic setulæ arranged in longitudinal rows. Costal vein ending at tip of 3rd vein, some distance before the wing-tip; auxiliary vein very short, complete or incomplete, turning down towards the 1st longitudinal; 3rd vein beginning before middle of wing, angled at base, thence straight; anterior cross-vein moderately long, oblique, 4th longitudinal forked very soon after contact with cross-vein, before middle of wing, the branches approximately parallel; 5th longitudinal forked about its middle, approximately under fork of 4th, the branches distinctly diverging; 6th and 7th veins distinct but short.

Range. Europe, Greenland, and Eastern Himalayas.

Life-history. Apparently nothing known beyond that the larvæ live in fungi, and that the perfect insects appear in woods and bushes in the spring. One species is said to do considerable damage in Europe to mushrooms.

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* Gen. Ins., Fasc. 93, p. 106 (1909).

"*Brachydicrania* and *Parexechia* do not differ from *Exechia* except that they possess but two ocelli while *Exechia* has three, the middle one being very minute. The forms with two ocelli should not be confused with *Mycetophila* which has very stout tibial lateral setæ, and larvæ with ambulacral setulæ. The larvæ of *Exechia* are commonly present in many species of fungi. They do not have the transverse rows of ambulacral setulæ"*.

66. **Exechia basilinea**, sp. nov. (Pl. II, fig. 12.)

♂ ♀. *Head* wholly yellow, apical third or half of flagellum blackish; frons and vertex with fine golden yellow hairs, a transverse row of short black bristles above the antennæ. In the female the frons and vertex, also the flagellum except at base, are blackish. *Thorax* reddish yellow, paler at sides. A row of stiff bristles of various sizes along anterior margin; several others on and below shoulders, two strong ones on each humerus, lateral ones towards the sides, a strong one on each posterior corner, and irregularly placed small ones on the dorsum; these latter conspicuous compared with the very minute yellow pubescence. Scutellum with an apical pair of curved bristles, crossing one another. with a similar, much smaller pair in front of them. Metapleura with stiff hairs. *Abdomen* reddish yellow, compressed, with short yellowish hairs; segments with a black basal band, which narrows towards the sides, but in its middle reaches the base of the following segment. Hind margin of 1st segment with a narrow, well defined, yellowish white band; belly pale. Genitalia of male consisting of a pair of large, at least two-jointed, claspers, with some narrow horny hook-like intermediate organs; a pair of small narrow bright lemon-yellow palp-like appendages appear to take the place of the dorsal plate, which is absent. In the female there is a pair of pad-like hairy plates and a long conical internal organ with an ovipositor. *Legs*: coxæ reddish yellow, femora pale yellow, tibiæ pale blackish yellow, tarsi blackish. *Wings* and halteres pale yellow.

Length 4½ millim.

Described from a single male and female in the Indian Museum, taken at Kurseong, Darjiling district, 3 and 4. vii. 08 (*Dr. Annandale*).

Genus MYCETOPHILA, *Mg.*

Mycetophila, Meigen, Illig. Mag. ii, p. 263 (1803).
Mycetina, Rondani, Dipt. Ital. Prod. i, p. 195 (1856).
Mycozetæa, Rondani, *loc. cit.* iv, Corrigenda, p. 12 (1861).
Fungivora, Meigen, Nouv. class. mouches (1800), *nom. nud.*

Genotype: Johannsen has set up *M. agarici*, Oliv., as the type-species.

* Johannsen, Gen. Ins., Fasc. 93, p. 106 (1909).

Head oval, flattened in front, placed very low on the thorax, so that in profile it makes a continuous curve with the thorax; front broad, the anterior margin produced into a triangle the apex of which reaches the base of the antennæ; eyes oval, ocelli two in number, placed close to the eye-margins. Palpi incurved, four-jointed, the 1st joint small, the 4th as long as or longer than the 3rd, usually slender, rarely oval. Antennæ arcuate, 16-jointed, the basal joints differentiated, setose at the apex, the flagellar joints cylindrical, compressed, pubescent. *Thorax* oval, highly arched, produced over the head, pubescent, with longer hairs on the lateral margins and over the base of the wing, posterior margin setose; scutellum usually semicircular, its margin setose; metanotum highly arched. *Abdomen* of the male six-segmented, anal segment usually small, forceps small; that of the female seven-segmented, more or less compressed, constricted at the base, ovipositor with two lamellæ. *Legs* stout, the femora compressed; tibiæ with spurs, fore tibiæ with small setæ on the outer side, middle tibiæ with two ranges of stout setæ on the extensor surface, and one range on the inner side; hind tibiæ with two or three ranges of long stout setæ on the extensor surface; plantæ of the hind tarsi ciliate with fine setulæ. *Wings* somewhat longer than the abdomen, oval, the base more or less rounded, the microscopic setulæ arranged in longitudinal rows. The costa ending before the tip of the wing, the auxiliary vein very short, ending free; the 1st longitudinal straight, ending at about two-thirds of the wing; the 3rd originating a little before the middle of the wing at a right angle and practically straight also; the 4th and 5th forked approximately at about the same place, nearly under the basal portion of the 3rd vein or immediately beyond it, the branches very gently diverging, or nearly parallel; 6th and 7th veins rather short and indistinct.

Life-history. Of several European species the life-history is known; that of *M. lunata*, Mg., for instance, has been worked out by Heeger, whilst *M. signata*, Mg. has been reared by Stannius from *Boletus edulis*; it frequents pinewoods. Heeger says that some species hibernate, reappearing in early spring, when they copulate after a few days. The larvæ live in fungi and decaying wood. The perfect insects occur anywhere in woods in the neighbourhood of fungi and are often taken on the windows of houses.

Range. Probably world-wide; yet the genus has not been actually recorded from Africa, or till now from the Continent of Asia, though it has been found in the East Indian Islands.

Fungivora, Mg., though synonymous, is inadmissible as well as all the other genera set up in Meigen's "1800 paper" as it has been termed, none having been accorded any species.

Table of Species.

1. Wings with a brownish mark or marks . . 2.
   Wings clear . . . . *cinctiventris*, sp. n., p. 115.

2. Two obvious distinct marks on each wing	3.
Only one obvious dark mark on each wing	4.
3. Shoulders yellowish; a brown transverse streak on apical half of wing; hind margins of abdominal segments yellowish	*quadrifasciata*, sp. n., p. 115.
Shoulders concolorous; a brown nearly round spot on the costa; hind margins of abdominal segments blackish	*curvilinea*, sp. n., p. 116.
4. Sides of thorax below shoulders considerably and distinctly grey	*griseolateralis*, sp. n., p. 116.
Sides of thorax never distinctly grey, and rarely paler	5.
5 (*a*). Thorax bright brownish yellow; an almost imperceptible pale blackish tinge over the tip of the wing	*suffusa*, sp. n., p. 117.
(*b*). Thorax dark shining brown; no blackish tinge over wing-tips	*himalayensis*, sp. n., p. 117.
(*c*). Thorax bright brownish yellow; a suffused brown oval spot at tip of basal cell	*binotata*, sp. n., p. 118.

67. **Mycetophila cinctiventris**, sp. nov.

? ♂. *Head*: frons and vertex chestnut-brown; face below antennæ (apparently) brownish yellow. Antennal scape yellow, flagellum brown. *Thorax*: anterior third reddish brown, darkening insensibly to blackish on the remainder; dorsum with very short golden yellow pubescence; entirely bare of bristles except two rather strong ones on each posterior corner. There are some weak bristles on the metapleuræ, and the scutellum has a row of four strong ones curved upwards. *Abdomen* slightly compressed, brownish black, with light greyish pubescence, hind borders of segments a little darker; a rather bright yellow band at the base of the 4th segment on the underside. Genitalia concealed. *Legs* pale yellowish; tips of coxæ, of hind femora and tibiæ blackish; tarsi blackish. *Wings* yellowish; halteres pale yellow.

Length 3 millim.

Described from a single specimen in the Indian Museum, taken at Simla, 10. vii. 09 (*Dr. Annandale*).

I presume the example to be a male, as only six distinct abdominal segments are present, and the abdomen is only slightly compressed, but no genital organs are visible.

68. **Mycetophila quadrifasciata**, sp. nov. (Pl. II, fig. 13.)

♂. *Head* above blackish brown; below antennæ reddish yellow; antennal scape yellow, flagellum brown. *Thorax*: dorsum dark brown, pubescent, anterior corners pale yellowish. Scutellum brown, with four bristles towards the hind margin, and a median

yellowish stripe, which shows a tendency to be continued on to the hind margin of the thorax. *Abdomen* very dark brown, rather compressed, hind margins of segments narrowly yellowish ; belly yellowish. Genitalia brown, composed of a pair of fleshy bi-hooked claspers *, enclosed by narrow side-plates united to an equally narrow dorsal plate, which latter terminates posteriorly in a pair of curved finger-like appendages. *Legs* yellowish, tips of coxæ and of posterior femora and tibiæ brownish, the colour widest on the hind pair. *Wings* yellowish ; a small brown oval spot, contiguous to the outer side of the basal cell, limited above by the 1st vein, and below by the lower branch of the 4th ; a brown streak from the costal margin filling the space between the tips of the 1st and 3rd veins, and proceeding in a zigzag course to the hind border between the branches of the 4th and 5th veins. Halteres yellow.

Length 3 millim.

Described from a single male in the Indian Museum, from Simla, 10. v. 09 (*Annandale*).

69. **Mycetophila griseolateralis**, sp. nov.

♂. *Head* blackish, vertex and frons with stiff yellow hairs. Antennæ dark chestnut-brown, with the exception of the tip of the 1st joint and whole of the 2nd joint of the scape, and the base of the 1st flagellar joint, which are yellowish ; all the flagellum with grey pubescence. Proboscis dark, palpi yellowish. *Thorax* blackish, with stiff yellow hairs ; sides of thorax from the shoulders to the wings distinctly grey, with yellow hairs as on the dorsum. Scutellum blackish with yellowish hairs and four long yellow bristles on the hind margin ; metanotum and sides of the thorax (except the grey part mentioned) black. Prothorax with two large bristles on each side behind the eyes, placed wide apart. *Abdomen* black, with moderately long yellowish hairs. Genitalia yellow, consisting of two side-plates, meeting below and covering the ventral surface, and a pair of two-jointed organs terminating in lamella-like tips. *Legs* : coxæ, femora, and tibiæ yellow, blackish at their junctures ; tarsi dark brown. *Wings* pale grey, with a suspicion of darkening on the anterior margin distally, a dark brown suffusion of limited extent over the base of the 3rd longitudinal vein and the anterior cross-vein. Halteres pale yellow.

Length $1\frac{3}{4}$ millim.

Described from one male from Tonglu, 10,000 ft., Darjiling district, 21. iv. 10 (*C. W. Beebe*).

Type in the Indian Museum.

70. **Mycetophila curvilinea**, sp. nov. (Pl. II, fig. 14.)

This species, if distinct from *M. quadrifasciata*, Brun. (*supra*), differs by the pale shoulder marks being absent ; the blackish

* It is not certain that there are not three terminal black hooks.

streak on the wing is replaced by a nearly round spot on the costa; the upper branch of the 4th longitudinal vein is slightly sinuous; the abdomen has the hind margins of the segments blackish.

One female taken by me at Darjiling, 10–16. x. 05.

Type in the author's collection.

71. **Mycetophila suffusa**, sp. nov.

♀. *Head* brownish grey, vertex with pale hairs, frons conspicuously triangular; lower part of head brownish yellow; antennal scape and base of flagellum yellow, remainder of flagellum brown. *Thorax* bright brownish yellow, with pale pubescence, and short black bristles on the dorsum, and with stronger ones round the margin. Pleuræ with a faint violet-brown tinge, all with weak bristles except the sternopleuræ. Scutellum concolorous, with four bristles. *Abdomen* rather dark brown with pale pubescence, posterior margins of segments narrowly black. *Legs* pale yellow, tibiæ and tarsi darker. *Wings* yellowish; a small oval dark brown spot over the anterior cross-vein, a very weak blackish (almost imperceptible) tinge over the tip of the wing. Halteres pale yellow.

Length 3 millim.

Described from a single female from Simla, 10. v. 09 (*Annandale*).

Type in the Indian Museum.

72. **Mycetophila himalayensis**, sp. nov.

♂. *Head* above dark chestnut-brown, shining, with greyish pubescence; below antennæ blackish brown, palpi yellowish. Antennal scape and 1st joint of flagellum yellow, remainder dark brown. *Thorax* dark shining chestnut-brown, with pale pubescence; anterior margin of dorsum moderately or narrowly pale yellow, the colour extending to the shoulders. No bristles on dorsum, three on mesopleura, two or three on posterior corners and four strong ones on the posterior margin of the dorsum. Scutellum concolorous, with normally four strong bristles, sometimes with more (one specimen has five, another seven, the middle or apical four always the strongest). *Abdomen* blackish brown or black, with pale pubescence; underside of some of the segments, generally the 2nd to the 4th, more or less yellowish, the colour extending to a varying degree over the sides, nearly to the dorsum. Genitalia very small, hardly apparent. *Legs*: coxæ and femora yellowish white, junction of these joints and tips of hind femora narrowly dark brown; tibiæ and tarsi barely darker, except the tips of the latter. *Wings* yellowish, anterior cross-vein suffused with a brown spot, the colour slightly encroaching on the basal cell. Halteres yellowish.

Length $3\frac{1}{4}$–$3\frac{1}{2}$ millim.

Described from nine males in the Indian Museum from Simla, 10. v. 09 (*Annandale*), and Naini Tal, 10. vi. 09.

73. **Mycetophila binotata**, sp. nov.

♂ ♀. *Head* bright brownish yellow, upper part with short black hairs; flagellum blackish, except towards base. *Thorax* with scutellum, metanotum and sides concolorous, with minute golden yellow pubescence; pleuræ sometimes brownish; the whole dorsum covered with irregularly placed black bristles, which occur liberally in rather stronger form around the marginal region of the thorax, on the humeri, with a fan-shaped row of five below the humeri; the scutellum bearing four strong ones towards the hind margin. *Abdomen* blackish, compressed, posterior margins of segments narrowly dull yellow. Genitalia in male with the 2nd joint very elongate, narrow, curved, erect, pointed at tip; in the female small, concealed; in both sexes brownish yellow. *Legs* yellowish, tibiæ slightly darker, tarsi blackish. *Wings* yellowish, rather darker on anterior part; a brown, suffused oval spot at tip of basal cell, enclosing the junction of the veins. Halteres yellow.

Length 3 millim.

Described from one male (*type*) taken by me at Darjiling, 20. ix. 08, with two other specimens from there, 26. ix. 08 and 29. v. 10 (*Brunetti*); a male from Ukhrul, Manipur; and two males and a female (*type*) from Simla, 10. v. 09 (*Annandale*).

Types in the Indian Museum.

Genus DELOPSIS, *Skuse*.

Delopsis, Skuse, Proc. Linn. Soc. N. S. Wales, (2) v, p. 623 (1890).

Genotype, *D. flavipennis*, Skuse; by original designation.

Head somewhat longish-round, flattened, situated deep in the thorax; front broad, the anterior border produced triangularly in the middle, the point reaching the basal joint of the antennæ; eyes oval; ocelli two, large. Palpi prominent, incurved, four-jointed, 1st joint small, 2nd robust, about two-and-a-half times the length of the 1st, 3rd slender, clavate, about the length of the first two combined, 4th very slender, clavate, the length of the first three combined. Antennæ porrect, arcuated, 16-jointed, 1st joint of the scape obconical, much longer than the 2nd, the 2nd cyathiform, setiferous at the apex; flagellar joints cylindrical, progressively diminishing in thickness, with a short downy pubescence. *Thorax* longish-ovate, gibbose, the anterior margin projecting somewhat over and closely applied to the head, as in *Sceptonia*, densely covered with short longitudinally disposed hairs; setiferous about the origin of the wings; scutellum semicircular, with long setæ; metanotum very short, steep, gibbose, almost hidden by the scutellum. *Abdomen* with six segments in both sexes; somewhat flattened, narrower than the thorax, narrowing at the base and apex. Genitalia not conspicuous in either sex.

Legs robust, coxæ broad; femora short, broadly flattened, especially the hind pair; tibiæ spurred, the fore pair without lateral setæ, intermediate pair with three ranges of strong spines on the outer and one on the inner side; hind pair with three ranges of stronger spines on the outer side; intermediate and hind tarsi spinulose. *Wings* about the length of the entire body, elongate, rounded off at the base, microscopically pubescent, the hairs not arranged in longitudinal rows. The costal vein ending at the tip of the 3rd vein; the auxiliary short, complete, turned forwards to the costa; the 5th vein forking much earlier than in *Mycetophila*, some distance before the anterior cross-vein; the 6th vein distinctly short; the 7th long, reaching the wing-border.

Range. Australia and Southern India.

74. **Delopsis collaris**, sp. nov.

♂. *Head* light tawny brown; antennal scape and base of flagellum yellow, rest of flagellum light brown. *Thorax* black, moderately shining, with pale yellow pubescence, anterior margin and shoulders broadly yellow; sides dark brown, bare. Dorsum bare of bristles, but a few in front of the wings, two strong ones on the posterior corners and four on the yellow scutellum. *Abdomen* brownish yellow; dorsum of first two segments black; 3rd, 4th and 5th black on dorsum except at base, the colour extending well over the sides of the 5th. Genitalia inconspicuous. *Legs* wholly yellowish. *Wings* and halteres yellowish.

Length $2\frac{3}{4}$ millim.

Described from a single example from Maddathorai, Travancore State, 17. xi. 08 (*Annandale*).

Type in the Indian Museum.

Subfamily SCIARINÆ.

The SCIARINÆ differ from the rest of the MYCETOPHILIDÆ taken *en masse*, in two principal features: (1) the coxæ, though somewhat lengthened, are normally formed instead of being greatly enlarged, and (2) the anterior cross-vein is very oblique, being always in a direct line with the main length of the 3rd longitudinal vein, that is to say, its length after its short erect basal portion. In their general appearance, their metamorphoses, habitats, and modes of life there is no difference.

The vast majority of the species fall into the gigantic genus *Sciara*, and are black or blackish in colour, varied occasionally by a little brown or brownish yellow about the legs or underside of the body; whilst a few species have reddish abdomens. Very few species are conspicuously marked; amongst Oriental species, such are, *rufithorax*, Wulp, *indica*, Walk., and three new ones herein described, *distinguenda*, *rufoabdominalis*, and *luteiventris*.

In the venation, the humeral cross-vein is present, the subcostal and posterior cross-veins are absent; the 1st and 3rd longitudinal veins (simple), the 4th and 5th (both forked) and 6th (short), are present.

Genus SCIARA, *Mg.* (Pl. II, figs. 15, 16, 17.)

Sciara, Meigen, Illig. Mag. ii, p. 263 (1803).
Molobrus, Latreille, Hist. Nat. Crust. Ins. xiv, p. 288 (1805).
Planetes, Walker, Ent. Month. Mag. iii, p. 178 (1836).
Planatella, Westwood, Synops. gen. Brit. Ins. p. 126 (1840).

Head rounded, proboscis barely prominent; eyes reniform; three ocelli, the middle one smaller than the others. Palpi two- or three-jointed, incurved, the last three joints subequal. Antennæ 16-jointed, projecting forwards, curved, longer in male than female, cylindrical; scapal joints differentiated, bare, flagellar joints not narrowed at base. *Thorax* arched, bare or practically so, but a few definite rows of stiff hairs in some of the species; scutellum small, with or without stiff hairs on the posterior margin. *Abdomen* 7-segmented, subcylindrical in male, conical or sub-conical in female, nearly or wholly bare. Genitalia of male prominent, apparently tolerably uniform in structure; in such species as I have been able to examine satisfactorily they consist of a pair of large, two-jointed, hairy claspers, attached to a very broad basal piece, the first joint being much thicker and larger than the 2nd, which is elongate or oval; there is also a small apparently bilobed intermediate organ. In the female the ovipositor is simple and small. *Legs* moderately long and slender, coxæ lengthened somewhat but not enlarged; femora flattened somewhat on the inner side; tibiæ with small apical spurs. *Wings* oval, moderately or comparatively broad; in repose folded over the abdomen. Auxiliary vein short, ending free; 1st longitudinal moderately long, ending some little distance before or beyond middle of wing; 3rd vein beginning at a right angle before middle of wing, rectangular at the bend and thence gently curved to some distance before the wing-tip; 4th longitudinal vein forked about its middle, but varying greatly, the branches parallel or divergent according to the species; 5th longitudinal forked widely at base, the two branches sometimes separated there; 6th vein short; 7th absent; anterior cross-vein very oblique, placed in a direct line with the main course of the 3rd vein and appearing as the basal portion of that vein, whilst the erect rectangular basal portion of the 3rd vein appears to be the cross-vein. Anal lobe of wing fairly full.

Range. World-wide.

Life-history. The metamorphoses of several species are known, and the usual habitat of the larva appears to be decomposing leaves, some species having been bred from apples, potatoes and other vegetables; a few live in cow-dung and a few under the bark of trees. These hatch out in eight or ten days according to Heeger.

A special peculiarity of the larvæ of more than one species of *Sciara*, is the habit of forming long processions, consisting of many thousand individuals. The column is sometimes one to two inches in breadth and several feet long, the creatures progressing by those behind climbing over the bodies of their companions in front and thus working their advance forwards, the larvæ being covered with a glutinous substance.

Fig. 10.—*Sciara*.

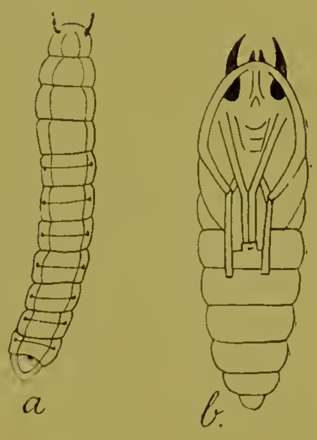

Fig. 11.
Larva (*a*) and pupa (*b*) of *Sciara*.

From this habit they are known in Germany as the "Heer-worm," or "army worm." The object of these migrations is not exactly known, as they take place only when the larvæ are nearly fully grown, and the suggestion that it is in search of new feeding grounds has been contested. *S. militaris* is the European species in which this peculiar habit has been most frequently observed.

Some species form a rough silky cocoon, others an earthy one in which to pupate.

One American species, *S. americana*, Wied., is known as the "yellow fever fly," but there is probably no connection between the insect and the disease. *S. inconstans*, Fitch, has been found in decaying apples in the Mammoth Caves of Kentucky, Hine saying that the larva bores into the stems of carnations. *S. pulicaria*, Mg., a common European species, has been bred by Dahlbom from rotting galls on *Salix pentandra*, whilst Girand bred *S. giraudii* from field mushrooms in Europe.

In endeavouring to classify the species of *Sciara* much difficulty is met with owing to the remarkably close general resemblance that they exhibit one to another.

No better form of primary classification than that adopted by Schiner and Winnertz* is at present obtainable, yet it is arbitrary and by no means satisfactory. The main character used by them is the relative length of the 1st longitudinal vein to the forking of the 4th longitudinal. Even if the length of the former is fairly constant in most species (I am almost sure it is not so by any means in *some* species) the latter character is liable to variation in any species, thus nullifying the value of any comparative measurements.

The first group is supposed to contain those species in which the 1st longitudinal vein extends up to or beyond the fork of the 4th vein; the second group, those in which it fails to reach the fork. There are, however, most certainly several species in which sufficient variation occurs to throw out theoretically some individuals, if classified strictly by this character, whilst the commonest species in India, *S. orientalis,* lies absolutely on the border line of both groups. Moreover, in a very distinct Oriental species, *S. rufithorax*, Wulp, the 1st longitudinal vein ends above the fork of the 4th vein in the male and distinctly beyond it in the female. But until more reliable characters are set up by specialists best competent to judge them, the present system of classification has to be retained.

Schiner's secondary divisionary character, the colour of the halteres, is certainly inapplicable with any degree of reliability to Oriental species, and its value outside a very limited number of forms seems problematical. So many species have various shades of colour between a distinct brown and yellow that opinions would differ widely in their allotment to one or other of the principal groups.

A rather more reliable character seems to be the length of the 1st longitudinal vein compared with the length of the wing, such measurements being taken from a line drawn through the base of the wing just before the humeral cross-vein.

Another character which appears consistent in such species in which it occurs, is the presence and number of stiff hairs on the posterior margin of the scutellum, and to a less extent, those along the dorsum of the thorax. These hairs on the scutellum are more frequently found in those species in which the 1st longitudinal vein is short.

The bulk of the types of the species described in the present work are preserved in the Indian Museum, but it must not be supposed that all the material there in this genus is disposed of, as a number of forms remain, represented by a considerable number of specimens, which may ultimately prove to be of specific value.

The following table must be received with some caution, pending

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* Winnertz's gigantic monograph published in 1863 is still the standard work and includes descriptions of all the European species known to that date.

a more complete knowledge of the group, but it may be noted that only forms of almost certain specific validity are described here from uniques; in all other cases more than one specimen, in several, quite a fairly good series, has been before me in drawing up the descriptions.

Possibly a few may be found to be identical with European species, since an exhaustive research into the descriptions of all those described from Palæarctic regions has not been practicable.

Table of Species.

1. The 1st longitudinal vein extending as far as, or beyond, the fork of the 4th longitudinal vein	2.
Intermediate species, in which the 1st longitudinal vein barely reaches fork of 4th vein, or ends distinctly and sometimes some little distance before it	*orientalis*, sp. n., [p. 135.
The 1st longitudinal vein ending before the fork of the 4th longitudinal vein (but sometimes approximate)	15.
2. Thoracic dorsum all yellowish, with or without stripes	3.
Thoracic dorsum wholly blackish or dark brown	7.
3. Thorax with three black stripes	4.
Thorax unstriped	6.
4. Wing surface distinctly pubescent; 1st longitudinal vein ends exactly at fork of 4th vein	*trilineata*, sp. n., [p. 126.
Wing surface not pubescent............	5.
5. The 1st longitudinal vein ends far beyond fork of 4th vein	*trifasciata*, sp. n., [p. 126.
The 1st longitudinal vein ends exactly opposite fork of 4th vein	*opposita*, sp. n., [p. 127.
6. Larger species (6 mm.): wings dark brown; femora bright reddish yellow; 1st longitudinal vein extends well beyond fork of 4th vein	*distinguenda*, sp. n., [p. 127.
Smaller species (3–5 mm.): paler wings; less contrast between femora and tibiæ; 1st longitudinal reaches fork of 4th vein in ♂, beyond it in ♀	*rufithorax*, Wulp, [p. 128.
7 (*a*). Abdomen with red dorsum	8.
(*b*). Abdomen with black dorsum, but sides or belly red or yellow	9.
(*c*). Abdomen wholly black	10.
8. Larger species ($5\frac{1}{2}$ mm.): 1st longitudinal vein ends beyond fork of 4th vein; wings blackish......................	*rufoabdominalis*, [sp. n., p. 129.
Smaller species ($2\frac{1}{4}$ mm.): 1st longitudinal vein ends exactly over fork of 4th vein; wings greyish	*luteiventris*, sp. n., [p. 129.

9. Abdomen with belly red . . . . *flammiventris*, sp. n., [p. 129.
Abdomen with a conspicuous red lateral stripe, often broken up into a row of spots . . . . *indica*, Walk., p. 130.
10. The 1st longitudinal vein ends distinctly beyond fork of 4th vein but sometimes only shortly so . . . . 11.
The 1st longitudinal vein ends exactly opposite fork of 4th vein * . . . . 14.
1 (*a*). All the coxæ and femora bright yellow, tibiæ and tarsi black . . . . *flavofemorata*, sp. n., [p. 130.
(*b*). Fore femora distinctly yellow or yellowish, posterior femora black or very dark brown . . . . *diversipes*, sp. n., [p. 131.
(*c*). All the femora black or blackish, or at most pale brown . . . . 12.
12. The 1st longitudinal vein ends at two-thirds of the length of the wing . . . . . . *longinervis*, sp. n., [p. 133.
The 1st longitudinal vein ends at or about the middle of the wing . . . . 13.
13. Larger species (5–6 mm.); 1st longitudinal vein ends a little beyond fork of 4th vein; wings and legs black . . . . *nigripennis*, sp. n., [p. 131.
Smaller species (4–5 mm.); 1st longitudinal vein ends considerably beyond fork of 4th vein; wings pale blackish, legs pale dirty brown . . . . *fratercula*, sp. n., [p. 132.
14. Shoulders black . . . . *exacta*, sp. n., p. 132.
Shoulders reddish yellow . . . . *flavicollis*, sp. n., [p. 134.
15. Wings with a wide infuscated band across the middle . . . . *fascipennis*, sp. n., [p. 136.
Wings without markings . . . . 16.
16. Thoracic dorsum mainly reddish yellow or brownish yellow; with or without stripes (the stripes in *latelineata* occupying nearly the entire dorsum) . . . . 17.
Intermediate species between groups 17 and 24 with chestnut-brown thorax . . *inconspicua*, sp. n., [p. 142.
Thoracic dorsum mainly black or blackish brown . . . . 24.
17. Flagellum of antennæ black, or at most, part of 1st joint yellow . . . . 18.
Flagellum with at least the two basal joints wholly yellow . . . . 23.
18. Thorax unstriped . . . . 19.
Thorax with three distinct stripes . . . . . . 21.
19 (*a*). Scutellum with six long stiff hairs on posterior margin . . . . *sexsetosa*, sp. n., p. 137.
(*b*). Scutellum with four similar long stiff hairs. . . . . *quadrisetosa*, sp. n., [p. 137.
(*c*). Scutellum with two similar long stiff hairs . . . . 20.

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* Within very close limits, a small individual variation must be allowed for.

20. Colour more pale yellowish .... *pallescens*, sp. n., [p. 137.

Colour deeper, more brownish yellow.... *fulvescens*, sp. n., [p. 138.

21 (*a*). Stripes narrow, median, with a row of stiff hairs on each. Length barely 2 mm. to tip of ovipositor .... *setilineata*, sp. n., [p. 138.

(*b*). Stripes very broad, black, occupying nearly the entire dorsum, except narrowly on shoulders .... 22.

(*c*). Stripes in two pairs, each pair joined on front margin, appearing like inverted black U's. Length barely 1 mm. .. [p. 139. *radicum*, sp. n., [p. 139.

22. Length $1\frac{1}{5}$ mm. .... *latelineata*, sp. n., [p. 140.

Length $3\frac{1}{2}$ mm. .... *impostor*, sp. n., [p. 141.

23. Smaller species, slender, dark brown .... *segmenticornis*, sp. n., [p. 141.

Larger species, much more robust, brownish yellow.................... *compacta*, sp. n., [p. 142.

24. Thorax with three obvious but not conspicuous black stripes near the centre, all furnished with rows of pale hairs .. *hirtilineata*, sp. n.,

Thorax unstriped .... 25.

25. Wings extending much beyond tip of abdomen .... 26.

Wings only normally longer than abdomen 27. [p. 143.

26. Tip of antennæ distinctly white .... *niveiapicalis*, sp. n., [p. 143.

Tip of antennæ concolorous .... *longipennis*, sp. n.,

27. Scutellar bristly hairs yellow .... *flaviseta*, sp.n., p. 144.

Scutellar bristly hairs black .... 28. [p. 145.

28. Thorax shining black.................. *nitidithorax*, sp. n.,

Thorax dull black .... 29.

29. The 3rd longitudinal vein ends nearly at the tip of the wing, and lies almost parallel with the costa .... 30.

The 3rd longitudinal vein normal ...... 31. [p. 145.

30. Smaller species ($1\frac{1}{2}$–2 mm.) : coxæ brownish yellow or pale yellow .... *longitudinalis*, sp. n., [p. 146.

Larger species ($3\frac{1}{2}$ mm.) : coxæ distinctly reddish yellow .... *ruficoxa*, sp. n., [p. 146.

31. Pleuræ wholly bright pale yellow ...... *flavipleura*, sp. n.,

Pleuræ bluish grey or blackish.......... 32. [p. 147.

32. The 1st longitudinal vein short .... *evanescens*, sp. n.,

The 1st longitudinal vein nearly reaches fork of 4th vein .... *parallela*, sp. n., [p. 147.

75. **Sciara trilineata**, sp. nov.

♀. *Head* blackish grey; palpi and antennal scape yellow, flagellum blackish with grey pubescence. *Thorax*: dorsum, rather sharply divided from the slightly wider lower part; three dark brown or black stripes, the median one from the centre of the anterior margin nearly to the hind margin; the two lateral stripes much shorter, not reaching the shoulders (in one example the median stripe is much fainter); sides dark blackish brown. Two rows of dorso-central stiff hairs, and stronger ones towards the sides. Scutellum dark blackish brown, with four somewhat larger pale stiff hairs and some smaller ones; metanotum dark brown. *Abdomen* and belly black; sides narrowly, but somewhat deeply bright yellow, the colour extending more or less to the hind margins of some of the segments both on the upper and lower sides. Ovipositor small, black, with a pair of two-jointed lamellæ. *Legs*: coxæ, femora and tibiæ brownish yellow; tarsi black, tibial spines reddish yellow. *Wings* pale yellowish grey, with microscopic hairs; 1st longitudinal vein ending exactly at fork of 4th vein (in the type) or immediately beyond it (in the second specimen); 2nd posterior cell 4½ times as long as broad, slightly widening at tip; 3rd vein originating distinctly before the middle of 1st vein; petiole and branches of 4th subequal. Halteres yellow, with elongated black clubs.

Length 2–2½ millim.

Described from two examples in the Indian Museum, from Darjiling, 8. viii. 09 (*type*) and 6. viii. 09 (both *Paiva*).

76. **Sciara trifasciata**, sp. nov.

♀. *Head* brownish yellow; mouth, palpi and ocellar triangle blackish. Scape and 1st flagellar joint bright reddish brown, 2nd flagellar joint more or less brownish yellow. *Thorax* shining orange-yellow, with three moderately broad dorsal blackish stripes (after the pattern of many TIPULIDÆ); the centre one beginning on the anterior margin, and the two lateral ones beginning behind the shoulders; they extend hindwards beyond the median stripe but do not reach the hind border. Scutellum concolorous, apparently no strong bristly hairs but some soft hairs towards the sides. Sides of thorax and metanotum more or less concolorous, but less bright, and not shining. *Abdomen* wholly black, roughened, with short black pubescence; belly similar; ovipositor of moderate size, normal, black. *Legs*: coxæ and femora rather bright brownish yellow, the latter moderately pubescent; tibiæ brown; tarsi black. *Wings* brownish grey; 1st longitudinal vein ending much beyond fork of 4th vein, petiole of 4th barely as long as its branches, which are in their distal two-thirds nearly parallel and gently curved; the 2nd posterior cell four times as long as broad. Halteres yellow, clubs black.

Length 5 millim., excl. ovipositor 1 millim.

Described from a single female in my collection, taken by me at Darjiling 10–16. x. 05.

77. **Sciara opposita**, sp. nov.

♂. *Head* blackish above, yellowish below, with black marks; palpi black; scape bright yellow, joints short; flagellum blackish, with black pubescence, more or less yellowish at base. *Thorax*: dorsum brownish yellow; three broad shining black stripes, filling most of the dorsal surface, with just the shoulders and posterior corners, and a narrow space between the stripes, pale; the lateral stripes widened posteriorly. Sides yellowish, pleuræ brown. Scutellum yellowish, with soft short hairs only; metanotum shining brown. *Abdomen* black, pubescent, hind margins of segments very narrowly pale, the colour much widened towards the side margins on underside. Genitalia large, brown, normal. *Legs*: coxæ and femora pale yellowish, a little pubescent, more or less black at their junction; tibiæ darker; tarsi dark brown. *Wings* clear; anterior cross-vein opposite middle of 1st longitudinal vein, which ends exactly opposite fork of 4th, the petiole of which is barely as long as the branches, which are nearly parallel but distinctly diverge towards tips; 2nd posterior cell three and a half times as long as broad. Halteres yellowish, clubs black.

Length $1\frac{1}{2}$ millim.

Described from one male in the Indian Museum, from Kurseong, Darjiling, 3. vii. 08.

The antennæ of the type-specimen are somewhat injured, with the result that some of the joints appear to be enlarged; at first sight it seemed as if the species would have to be referred to a different genus, but for the present I leave it in *Sciara*. Beyond this damage and a slight crushing of the thorax by the pin, the specimen is perfect.

78. **Sciara distinguenda**, sp. nov.

♂. *Head* bright orange-yellow, with short black hairs. Palpi dark brown; ocellar triangle blackish, with a very narrow black median line behind. Scape brownish yellow, flagellum black. *Thorax*, including scutellum and metanotum, wholly bright orange-yellow, almost bare, a few short stiff hairs laterally, and some short soft ones about the shoulders and on posterior margin of scutellum. *Abdomen* wholly dull black, with black pubescence; belly similar. Genitalia long, black, pubescent, consisting of a pair of upper plates (having the appearance of an 8th and 9th segment), a pair of two-jointed lateral claspers and a ventral elongate organ. *Legs*: coxæ and femora bright orange-yellow; former with short stiff black hairs at tip; latter with a small black spot below at the base. Tibiæ and tarsi wholly black, tips

of tibiæ with red-brown spines. *Wings* dark brown; 1st longitudinal vein ending distinctly beyond fork of 4th; petiole of 4th barely as long as its branches, which are gently curved and divergent; the 2nd posterior cell three times as long as broad. Halteres black, stems pale yellow.

Length 6 millim.

Described from one male in the Indian Museum, taken at Darjiling, 7000 ft., 12. viii. 09 (*Dr. Jenkins*).

79. Sciara rufithorax, *Wulp.* (Pl. III, fig. 15.)

Sciara rufithorax, van der Wulp, Dipt. Sumatra Exped., p. 6, pl. i, fig. 1.

♂ ♀. *Head* black, vertex shining, palpi blackish; antennæ dark brown or black, scape yellow or brownish, occasionally base of 1st flagellar joint pale also. *Thorax* brownish yellow, sometimes reddish yellow or ferruginous, shining, practically bare. Scutellum and metanotum concolorous. *Abdomen* black, roughened, with a few very short hairs. Genitalia conspicuous and large in male, the 1st joint bright brownish yellow, the 2nd joint black, both with short rather thickly set hairs. In female two pointed lamellæ terminate the somewhat conically shaped abdomen. *Legs*: femora brownish yellow, a small black spot below at extreme base; tibiæ a little darker, and darker still in female; tarsi brown. *Wings* blackish; 1st longitudinal vein ending more or less at middle of wing, opposite fork of 4th vein in male, and some distance beyond it in female; petiole of 4th vein a little shorter than its branches in male and much shorter in female, the branches nearly parallel and slightly curved; the 2nd posterior cell about three and a half times as long as broad; the 5th vein widely forked at base; the 3rd longitudinal vein beginning distinctly before the middle of the wing.

Length 3–5 millim.

Redescribed from a good series of both sexes in the Indian Museum from India, Assam, Burma, Ceylon, and probably West China also. The species was described originally from Sumatra, and probably occurs throughout the greater part of the Oriental Region. There are specimens in the Indian Museum from Rajmahal, Bengal, 5–7. vii. 09 (*Annandale*), at light; Goalbathan, E. Bengal, 9. vii. 09 (*Hodgart*); Purneah, Bengal, 31. xii. 09 (*Paiva*); Calcutta, 21. xi. 07, on steamers crossing River Ganges, Damakdia Ghat, 30. vi. 08 (*Annandale*); Shasthancotta, Travancore, S. India, 8. xi. 09 (*Annandale*); Ukhrul, Manipur (*Pettigrew*); Moulmein, Burma, 28. ii. 08 (*Annandale*); and Trincomali, Ceylon, ix. 1910. A female in my collection is from Kandy, Ceylon, viii. 09 (*Green*). A male in the Indian Museum from Tenygueh, Yunnan, West China, taken by Mr. J. C. Brown, is apparently a dark variety, the thorax and genital organs being nearly blackish; whilst another male in the same collection taken by Mr. d'Abreu

at Kurseong, November 1910, has a nearly black thorax, but the genital organs are reddish yellow as in normal specimens.

Type. The location is unknown to me.

The bright yellowish thorax, the large yellowish genitalia of the male, and the black body and wings, make this species easily recognisable. The female is rather larger than the male. Van der Wulp's coloured plate is excellent, and de Meijere gives additional notes.

The fact seems to have escaped notice that the 1st longitudinal vein is much longer in the female than in the male.

80. **Sciara rufoabdominalis**, sp. nov.

♀. *Head* black; mouth-parts and scape dark reddish brown; (flagellum missing). *Thorax,* scutellum and metanotum shining black; (scutellum crushed by pin). *Abdomen* and belly orange-red; base of 1st segment above, and whole of last segment, black. Ovipositor small, black. *Legs* black, tibial spines pale. *Wings* pale blackish; 1st longitudinal vein ending much beyond fork of 4th, the branches of the latter subequal to the petiole in length, parallel, rather curved; the 2nd posterior cell four times as long as wide. Halteres black.

Length $5\frac{1}{2}$ millim.

Described from one female in the Indian Museum from Ukhrul, Manipur, 6400 ft. (*Pettigrew*).

81. **Sciara luteiventris**, sp. nov.

♀. This species closely resembles the preceding one, but owing to its being only half the size, I do not like to consider it identical. The first two dorsal abdominal segments are wholly blackish, the 3rd and the apical two (mainly) also blackish, the remainder yellowish or red. The abdomen seems more hairy. A distinct difference in the wing is that the 1st longitudinal vein only reaches the fork of the 4th, and the branches of the 4th, which are slightly longer than the petiole, are nearly straight and almost parallel, only diverging a little at the tips. The 2nd posterior cell is four and a half times as long as broad. Halteres black.

Length $2\frac{1}{4}$ millim.

One female in the Indian Museum from below Phagu, 7000 ft., Simla district, 12. v. 09 (*Annandale*).

82. **Sciara flammiventris**, sp. nov.

♀. *Head* black; scape bare of bristles, but flagellum normally pubescent. Eye-facets whitish. *Thorax* dark blackish grey, nearly bare, shoulders very narrowly reddish; with a black narrow median line, on each side of which is a large velvet-black oval outline, incomplete posteriorly; anterior margin of dorsum also blackish. Scutellum (broken by pin) and metanotum black. *Abdomen* dull black, broad, the segments very distinct. Belly

orange-red. Ovipositor apparently two-jointed, with a pair of small terminal oval lamellæ, black. *Legs* dark blackish brown. *Wings* pale blackish, iridescent; 1st longitudinal vein ending exactly at fork of 4th; petiole and branches of 4th vein subequal; 2nd posterior cell slightly enlarged at tip, three times as long as broad. Halteres black.

Length 2½ millim.

One female in the Indian Museum, from Darjiling, 7000 ft., 6. viii. 9 (*Paiva*).

83. Sciara indica, *Walk.*

Sciara indica, Walker, Ins. Saund., Dipt., pt. 5, p. 419 (1856).

♀. *Head* and *body* all black; legs very dark brown or blackish. A lateral red or reddish yellow stripe on the abdomen, which is often broken up into spots, and bears a slight fringe of reddish yellow hairs. Genitalia normal. A small, often indistinct (and sometimes absent) pale yellowish spot on the shoulder. *Wings* quite blackish; 1st longitudinal vein long, extending beyond middle of wing and beyond fork of 4th vein; 3rd longitudinal originating very early, before one-fourth of the wing, the vein forming a distinct curve after the bend; anterior cross-vein very oblique and long; petiole and branches of 4th longitudinal vein subequal: 2nd posterior cell nearly four times as long as broad; 5th longitudinal vein forked very near base, the branches diverging suddenly at half their length; 6th vein distinctly not reaching border of wing. The wing is normally blackish but is sometimes brown or blackish brown, the anterior half usually darker than the posterior. Halteres black.

Length 4½–8 millim.

Redescribed from a good series of females only in the Indian Museum, from Darjiling, 5. viii. 09 (*Paiva*); Kurseong, 13-16. vii. 07 (common), 14. viii. 09 (*Paiva*); Siliguri, Bengal, 18–20. vii. 07; Bhim Tal, Kumaon, 19–22. ix. 06 (*Annandale*).

Type in the British Museum.

Walker's description of this species is quite correct, with one exception, as he says the basal part of the 4th longitudinal vein ("subapical") is whitish, but I do not find this to be the case.

84. Sciara flavofemorata, sp. nov.

♂. *Head* black above; face and mouth-parts brown, with a little yellow, as are also the scapal joints; flagellum black, with distinct, rather elongated joints bearing rather dense grey pubescence; palpi black. Eyes black, with grey pubescence. *Thorax* black, hardly shining; reddish on humeri and below shoulders, and a little laterally and across metanotum. Sides reddish brown, scutellum blackish, with soft hair only. *Abdomen* black, pubescent. Genitalia large, consisting of a pair of thick,

hairy, two-jointed claspers ; the basal half of the 1st joint brown, the remainder of the organ black. *Legs* : coxæ and femora bright yellow, black at their junction ; tibiæ blackish brown ; tarsi black. *Wings* distinctly brownish ; 1st longitudinal vein ending distinctly beyond fork of 4th, of which the petiole and branches are subequal; 2nd posterior cell three times as long as broad, normal. Halteres black.

Length 4½ millim.

One male in the Indian Museum from Kurseong, 5000 ft., 8. vii. 08.

85. **Sciara nigripennis**, sp. nov.

♂ ♀. *Head* wholly black ; flagellum very minutely pubescent ; scapal joints short. *Thorax* black, nearly bare, except for some long stiff hairs laterally above the wings. Scutellum with numerous soft hairs only. *Abdomen* wholly black, pubescent. Genital organs of male consist of a large dorsal, nearly semicircular, plate and a pair of strong normally shaped claspers, all wholly black. Ovipositor narrow, black, with two small terminal lamellæ. *Legs* black. *Wings* normally quite blackish, but occasionally a little paler ; the 1st longitudinal vein ending distinctly but not much beyond the fork of the 4th ; petiole and branches of 4th vein subequal ; 2nd posterior cell with sides either parallel or slightly diverging, generally slightly curved, three and a half to four times as long as broad. Halteres black.

Length 5–6 millim.

Described from a type male taken by me at Darjiling, 26. v. 10, and females in the Indian Museum from Darjiling, 29. ix. 08 and 28. v. 10 (*Brunetti*) ; Kurseong, 13. viii. 09 (*Paiva*) ; Ukhrul, Manipur (*Pettigrew*) ; Bhim Tal, Kumaon, 19–22. ix. 06 (*Annandale*) ; Pashoke, Sikkim, 2000 ft., 5. ix. 09 ; Pattipola, Ceylon.

Types ♂ and ♀ in the Indian Museum.

A male in the Indian Museum from Kurseong, 26. vi. 10, taken by Dr. Annandale, has the 1st longitudinal vein ending some distance before the fork of the 4th vein, but it agrees with *S. nigripennis* in all other particulars. Several females in the same collection, captured by Mr. C. W. Beebe at Kuching, in Sarawak, Borneo, are much smaller in size (barely 4 mm. to nearly 4½ mm.) and have the legs moderately pale brown ; their dates are 23. vi. 10 to 4. vii. 10.

86. **Sciara diversipes**, sp. nov.

♂ ♀. Very near *S. nigripennis*, but certainly quite distinct. The differences are as follows :—

1. Fore femora distinctly yellow, more or less dull, but in complete contrast with the rest of the legs, which are generally

more dark brown than black; in a few specimens the whole of the femora are lighter.

2. The wing is distinctly less blackish; petiole of 4th vein equal to or slightly longer than its branches.

3. In size it is apparently a smaller species, none of the specimens present being nearly so large as the smallest ones of *S. nigripennis*.

The genitalia are large, black, pubescent, consisting of a pair of wide two-jointed claspers, with a moderately prominent intermediate organ.

Length 3½–4½ millim.

Described from several males and two females in the Indian Museum from Darjiling, 10. viii. 09 (*Paiva*); Ghoom, above Darjiling Town, 7500 ft., 18. ix. 08; Kurseong, 13–16. vii. 07; Siliguri, N. Bengal, 18–20. vii. 07, this latter place being in the plains at the foot of the Darjiling Hills.

From the enlarged genital organs, in conjunction with the yellow fore femora it appeared at first in complete accordance with Schiner's description of *S. analis*, a species he attributes to Egger, 1863 (Verh. zool.-bot. Wien, xiii), but which I am unable to trace, and which the Paläarktischen Dipteren Katalog refers to Schiner himself; but the genital organs, although enlarged, are not extraordinarily so, and the probability is that it is a new species. It does not agree in size with three European examples named '*analis*' in the Indian Museum, being much larger; but there is no certainty that these three specimens are correctly identified, being females.

87. **Sciara fratercula**, sp. nov.

♀. This species also is very akin to *S. nigripennis*, and may possibly be identical with it. The differences are:—

1. The 1st longitudinal vein extends for some distance beyond the fork of the 4th, and beyond the middle of the wing.
2. The wing is distinctly less black.
3. The legs are pale dirty brown, not black.
4. In size it is smaller and a more slender species.

Length 4–5 millim.

Described from several females in the Indian Museum from Kurseong, 7. ix. 09 (*Annandale*); and one female from Bhim Tal, Kumaon, 22–27. ix. 06 (*Annandale*).

This and the following two are almost the only species of *Sciara* described in this work of the specific validity of which there is any reasonable doubt.

88. **Sciara exacta**, sp. nov.

♀. Considerably resembling *S. nigripennis*, but differing by the 1st longitudinal vein ending exactly opposite the fork of the 4th,

and practically exactly in the middle of the wing. *Legs* pale dirty brown.

Length 2–5 millim.

Described from specimens in the Indian Museum from Darjiling, 4–7. viii. 09 (*type*, *Paiva*); Kurseong, 7. ix. 09, 4–8. vii. 08, and Ghoom, 7500 ft., Darjiling district, 19. ix. 08; Siliguri, 18–20. vii. 07; near Bhowali, Kumaon, 5700 ft., vii. 1909 (*Imms*); Ukhrul, Manipur, 6400 ft. Also from some in my own collection from Darjiling, 10–16. x. 05, and Shanghai, 9. v. 06 (both taken by me), and from Ohiya, Ceylon (*E. E. Green*).

Types in the Indian Museum.

Two females examined by me from Kurseong, 26. vi. 10, and Ghoom, 19. ix. 08, have the prothorax distinctly yellowish.

Twenty specimens in the Indian Museum agree in venation exactly, and mainly so in the characters they have in common with *nigripennis*, being moreover uniformly less in size than that species. The form may at least provisionally be regarded as distinct.

89. **Sciara longinervis**, sp. nov.

♀. Though allied to *S. fratercula* in general appearance, the single example of this form, in the Indian Museum, is distinguished by the 1st longitudinal vein extending to two-thirds the length of the wing, much beyond the fork of the 4th vein, being (with the 3rd longitudinal also) rather nearer the costa than usual, also being deeper and thicker than the remaining veins; petiole of 4th vein very slightly longer than the branches. Femora pale dirty brown.

Length 3¾ millim.

Described from two females in the Indian Museum, from Siliguri, 18–20. vii. 07 (*type*) and Kurseong, x. 1910 (*D'Abreu*). A female in the Pusa collection from Mussoori, viii. 1906.

The general "facies" of the insect is that of a different species, but it may prove to be an aberrant form of *S. nigripennis*.

Notes on the S. nigripennis *group.*—The forms I group with *nigripennis* are *diversipes*, *fratercula*, *exacta*, and *longinervis*. Their inter-relations, so far as I observe them, are comprised in the preliminary table of species, yet they may be found difficult of differentiation by that means, from the very nature of the distinguishing characters, and the acknowledged variability of these. The forms may possibly represent varieties of a single species, although this is very doubtful, from the fact that, excepting the unique female of *longinervis* from Siliguri, none of them is confined to a special locality. Of the eight localities represented by the five forms, *nigripennis* occurs in five, *diversipes* in four, *fratercula* in two, *exacta* in six; these localities, be it noted, being fairly widely separated either by distance or by altitude. Moreover, the fact that one sex (the female) is present in all the forms

tends to support the view of specific validity ; the male is known in *nigripennis* and *diversipes* only. Were it not that each form, except *longinervis*, is represented by several examples (*nigripennis* by ten, *diversipes* by eight males and two females, *fratercula* by seven, and *exacta* by twenty), I should have hesitated to describe more than one of them ; but when arranged side by side, the impression given is certainly that of five closely allied though distinct species, practically little difficulty being encountered in allotting any particular specimen to its respective species. Yet the characters on which they are separated, namely, the length of the 1st longitudinal vein, the branches of the fork of the 4th, the colour of the legs and the size of the insect, are admittedly variable. The first character, however, is apparently quite consistent in *exacta* * ; the yellowish femora similarly so in *diversipes*; and the great length of the 1st longitudinal vein in *longinervis*, being greater than in any other specimen of Oriental *Sciara* that I have seen ; and these facts seem to point to specific distinctness.

There is, therefore, only *fratercula* which may eventually be merged with *nigripennis*, the difference in the length of the 1st vein in these species being less distinctly marked than in the others. These two forms are provisionally regarded as distinct only on the apparent constancy of four characters combined :— the colour of the wings and of the legs, the length of the 1st vein, and the size.

It will be noted that in these remarks, *flavofemorata* and *flavicollis* are not included, although they appear in the same section in the table of species ; this is because from their coloration they cannot be confused with the species under discussion.

90. Sciara flavicollis, sp. nov.

♂ ♀. *Head* black, face sometimes a little brownish or yellowish ; palpi black ; antennæ black with the scapal joints generally reddish or yellowish. *Thorax* shining black, nearly bare ; shoulders and anterior margin more or less narrowly brownish or yellowish, the colour sometimes confined to the shoulders, sometimes spreading along the sides of the dorsum. Scutellum dark shining brown, nearly bare, with several stiff long black hairs. Stiff long hairs also along the sides of the dorsum of the thorax. Metanotum and hind pleuræ dark shining brown. *Abdomen* black, with black pubescence, hind margins of segments generally almost imper-

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* If, however, *exacta* be placed in juxtaposition to *orientalis* (which latter species I have regarded as intermediate between the two principal groups), some hesitation may be encountered respecting the specific validity of these species, since specimens admittedly of *orientalis* have the venation of *exacta*, and there is therefore only the smaller size to distinguish the former species. I should not be surprised to find them identical, in which case I propose that the name *orientalis* be retained, as more appropriate ; moreover, *exacta* would in such a case be incorrect.

ceptibly grey. Genitalia very large; a pair of elongated, two-jointed, thick, hairy claspers, the basal joint mainly reddish brown or dark brown, the 2nd joint black. In the female there are two terminal, rather large, flattened, broad lamellæ. *Legs* pale yellow, often a little brownish at the tips of the coxæ, tibiæ darker dirty yellow, tarsi blackish. *Wings* pale yellowish grey; the 1st longitudinal vein reaching as far as the fork of the 4th vein or ending a short distance before it; petiole and branches of 4th vein subequal; 2nd posterior cell a little over three times as long as broad, slightly widened at tip. Halteres black.

Length 3 millim.

Described from four males and some females in the Indian Museum. The type male from Siliguri at the foot of the Darjiling Hills, 18–20. vii. 07 (*Brunetti*); type female from Darjiling, 1. x. 08 (*Brunetti*); the other males from the latter locality 26–29. vi. 10 (*Annandale*), the other female from Kurseong, 29. vi. 10 (*Annandale*).

Types in the Indian Museum.

The length of the 1st longitudinal in its relation to the fork is certainly variable, one female from Kurseong, 26. vi. 10, having it so short as technically to fall into the short-veined or second great division of the genus; yet it seems impossible to consider it as distinct from the present species, in view of the admitted variability of this character in the other specimen before me and the certain knowledge of its natural tendency to vary in very many species.

91. **Sciara orientalis**, sp. nov.

♂ ♀. *Head* black; antennæ blackish, blackish brown or dark brown, sometimes pale yellowish brown at base, including more or less of the 2nd scapal joint; thickly pubescent. Palpi yellowish brown or brown. *Thorax* blackish, brown or dark brown, comparatively bare, lateral stiff hairs weak; scutellum and metanotum concolorous, former with soft hairs only. *Abdomen* black or blackish brown; belly similar, pubescent. Genitalia of male normal, rather large; of female inconspicuous. *Legs* varying from almost wholly pale yellowish to dark brown or blackish, generally concolorous, the prevailing colour being moderately dark yellowish brown, with the tibiæ and tarsi darker. *Wings* yellowish brown or yellowish grey, variable; 1st longitudinal vein ending sometimes some little distance before the fork of the 4th, at times approximate to or level with it, rarely slightly beyond it; petiole of the 4th vein as long as, or (generally) a little longer than the branches, which are moderately parallel, slightly curved and a little diverging at the tip; 2nd posterior cell normally a little over three times as long as broad, but varying up to four times the length. Halteres brown, variable.

Length 2–3 millim. normally.

Described from a considerable number of both sexes in the Indian Museum from the following localities :—

Darjiling, 2–8. viii. 09 (*Jenkins*); Kurseong, 6. vii. 08; Bhim Tal, Kumaon, 22–27. ix. 06 (both *Annandale*); Siliguri, N. Bengal, 18–20. vii. 07; Mandalay, Burma, 12. iii. 08 (*Annandale*): Ukhrul, Manipur (*Pettigrew*); Sylhet, Assam, 6. v. 05 (*Lt.-Col. Hall*); Dawna Hills, Lower Burma, 2–4. iii. 08 (*Annandale*); Calcutta, common January to May, and July to September (*Annandale* and others); Lucknow, 9. ii. 08; Bijnor district, United Provinces, 11. ii. 07: on board ship, Khulna district, Ganges Delta, 21. viii. 09 (*Jenkins*); Trivandrum, Tenmalai and Maddathorai, Travancore State, 14–22. xi. 08 (*Annandale*); Peradeniya, Ceylon, viii. 1910. Also in my collection from several Oriental localities.

Types in the Indian Museum.

Three females in the Indian Museum have distinct yellow halteres, but differ from typical specimens in no other way. The colour of these organs being distinctly variable it is inadvisable to rank these specimens as forming even a variety. Two are from Kurseong, 4. vii. 08, one from Ukhrul, Manipur. Four specimens from Kurseong, 27. vi. 10 (*Annandale*) have pale yellow legs and are slightly inferior in size. One specimen from Darjiling, 8. viii. 09, is nearly 4 mm. in length.

The amount of variation in the distance at which the 1st longitudinal vein terminates is greater in *S. orientalis* than in any other Eastern species, of which it is the most variable generally. The antennæ appear to vary considerably in thickness, especially in the male, also in the amount of pubescence.

Occasional specimens are met with with yellowish or brownish yellow shoulders, the colour sometimes running narrowly along the anterior margin of the thorax. Such specimens do not appear specifically distinct from the typically all black examples.

92. Sciara fascipennis, sp. nov.

♀. *Head* wholly dull black; palpi and proboscis dark brownish yellow. Antennæ missing, except 1st scapal joint which is black, and extremely narrowly brownish yellow at the tip. *Thorax* dull black; dorsum moderately shining; scutellum with traces of some long apical stiff hairs. *Abdomen* dull black; the 1st two segments dull reddish brown on the upperside; belly black; ovipositor elongate but normal. *Legs* rather dark brown. *Wings* very pale grey, with a moderately pale blackish band (hardly darker anteriorly) across the middle third. Halteres black.

Length 2 millim. excl. ovipositor $\frac{1}{2}$ millim.

Described from a male from Kurseong, xi. 1910 (*D'Abreu*).

Type in the Indian Museum.

This species is easily recognised from every other Oriental *Sciara* by the broad infuscated band across the centre of the wings.

93. **Sciara sexsetosa**, sp. nov.

♀. *Head*, vertex and frons dark brown; face below antennæ bright reddish yellow. Scapal joints rather large, subglobular, bright yellow; flagellum black, with grey pubescence, palpi black. *Thorax* bright reddish brown, shoulders slightly yellowish; two well separated rows of small dorso-central bristly hairs; eight or ten strong ones laterally, and a row of six long bristles on the hind margin of the scutellum, which is, with the metanotum and sides of the thorax, concolorous, the pleuræ being blackish. *Abdomen* black, pubescent, hind margins of segments narrowly grey; belly yellowish. *Legs*: coxæ reddish yellow, with black hairs at tip; femora yellowish, black at base below; tibiæ darker; tarsi black. *Wings* pale grey; 1st longitudinal vein ending much before fork of 4th and barely reaching middle of wing; 2nd posterior cell four times as long as broad, branches of 4th vein equal in length to petiole; gently divergent throughout. Halteres yellowish, base of clubs blackish.

Length 3–3¾ millim.

Described from three females in the Indian Museum, from Darjiling, 6000 ft., 20. ix. 08 (*Brunetti, type*) and 7000 ft., 6. viii. 09 (*Paiva*); Pashoke, Sikkim, 2000 ft., 5. ix. 09.

94. **Sciara quadrisetosa**, sp. nov.

♂. *Head*: vertex and frons black; face reddish yellow; palpi black, scape yellow (flagellum missing). *Thorax* brownish yellow, humeral region a little paler. Bristles as in *S. sexsetosa*, but only four long ones on the scutellum. Scutellum and metanotum concolorous, pleuræ blackish. *Abdomen* dark brown, hind margins of segments very narrowly yellowish grey; belly paler. Genital claspers large, thick, brownish yellow, hairy, two-jointed, the 2nd joint elongate oval. *Legs*: coxæ and femora pale yellow, the former hairy at the tip, the latter black below at base; tibiæ dirty yellow; tarsi black. *Wings* nearly clear; 1st longitudinal vein ending shortly before fork of 4th of which the petiole and branches are subequal; 2nd posterior cell three times as long as broad, slightly widening towards the tip. Halteres yellow, streaked with black.

Length 2½ millim.

One male in the Indian Museum, Darjiling, 7000 ft., 6. viii. 09 (*Paiva*). A damaged specimen from Ukhrul, Manipur, 6400 ft., appears to be the same species.

95. **Sciara pallescens**, sp. nov.

Head blackish grey; palpi yellowish. Antennæ proportionately rather large and long, scape yellowish, flagellum black, with grey pubescence. *Thorax*, scutellum and metanotum light brownish

yellow. Bristly hairs normal, only two conspicuous ones on the scutellum, but some other very small ones are present. *Abdomen* pale brownish yellow, with a little intermixed black and pale pubescence. *Legs* yellowish, tibiæ brownish yellow, tarsi darker, femora very narrowly black at base below. *Wings* clear; the 1st longitudinal vein ending much before the fork of the 4th vein and distinctly before middle of wing; branches of 4th vein parallel and much shorter than the petiole; 2nd posterior cell three and a half times as long as broad. Halteres yellow, base of clubs black.

Length $1\frac{1}{2}$ millim.

Described from a single specimen of uncertain sex in the Indian Museum, taken 7. iii. 08 by Dr. Annandale flying in the darkest part of the largest of the Khayon ("Farm") Caves, nine miles from Moulmein, Tenasserim, in company with the moth *Crysithyris spelæa*, which Meyrick (Rec. Ind. Mus. ii, p. 399) states to be the only Lepidopteron yet known that is adapted for a cavernicolous existence.

96. **Sciara fulvescens**, sp. nov.

♀. Almost wholly brownish yellow. Vertex blackish, dorsum of thorax and the tibiæ a little darker; antennæ dark brown, joints very distinct, tarsi black. *Wings* clear; 1st longitudinal vein ending much before fork of 4th and distinctly not reaching middle of wing; petiole and branches of 4th vein as in *S. pallescens*; 2nd posterior cell with practically parallel sides, three times as long as broad.

Length $1\frac{1}{4}$ millim.

Described from a single female in the Indian Museum from Rajshai, East Bengal, 1–6. ii. 07 (*Annandale*).

Possibly identical with *S. pallescens*.

97. **Sciara setilineata**, sp. nov.

♂ ♀. *Head* blackish, lower part and palpi brownish yellow; scape pale yellow, flagellum blackish. *Thorax* light reddish brown, with three narrow median lines, the outer ones bearing the dorso-central rows of stiff hairs, the median one with a row of microscopic bristly hairs. Sides, scutellum and metanotum concolorous; scutellum with two apical long stiff hairs, and also with softer hairs. *Abdomen* dark brown, pubescent; genitalia normal. *Legs* with yellow coxæ and femora, blackish at their junction, tibiæ and tarsi dirty yellow. *Wings* clear, 1st longitudinal vein ending much before fork of 4th vein and distinctly before middle of wing; petiole and branches of 4th vein subequal; 2nd posterior cell with parallel sides, three and a half times as long as broad. Halteres yellow.

Length 2 millim.

Described from a type male from Simla, 10. v. 09 (*Annandale*) and a type female from Darjiling, 6. viii. 09 (*Paiva*).

Types in the Indian Museum.

There seems little doubt that the two specimens represent the two sexes of one species.

A specimen from Peradeniya, Ceylon, agrees closely with the female, but has four distinct long scutellar bristles, and is slightly smaller, whilst the hairs on the middle thoracic stripe are much stronger; it is possibly a variety.

98. **Sciara latelineata**, sp. nov.

♂. *Head* blackish; palpi, scape, and major part of 1st flagellar joint pale yellow. *Thorax* brownish yellow, shoulders broadly pale yellow; dorsum almost entirely occupied (except on the shoulders) by three broad contiguous black stripes extending to the brown scutellum, which bears four bristles. *Abdomen* dark brown, hind margins of segments very narrowly grey. Genitalia normal, brownish yellow. *Legs* pale yellow, tarsi dark. *Wings* clear; 1st longitudinal vein ending much before fork of 4th and distinctly before middle of wing; petiole of 4th vein imperceptible, approximately equal to the branches; 2nd posterior cell with parallel sides, three times as long as broad. Halteres long, stems yellowish, clubs blackish, elongated.

Length $\frac{1}{4}$ millim.

One male in the Indian Museum from the western slopes of the Dawna Hills, Tenasserim, 2000–3000 ft., 2 or 3. iii. 08 (*Annandale*).

99. **Sciara radicum**, sp. nov.

♂ ♀. *Head* wholly black, scape of antennæ yellowish. *Thorax* yellowish, with two black oval outlines on dorsum, incomplete posteriorly, and a narrow median dorsal line. Scutellum yellow, with apparently normally six long bristles on the posterior margin, but the inner four are always longest, and there are generally some short ones towards the sides; metanotum darker. *Abdomen* dark brown, hind margins of segments a little blackish; belly yellow. Genitalia large, dirty yellow. *Legs* pale yellow, with a black tinge between coxæ and femora; tibiæ and tarsi darker; hind tibiæ with a distinct row of setæ on the outer side. *Wings* clear; 1st longitudinal ending much before fork of 4th and barely attaining middle of wing; petiole of 4th much longer than fork, the branches of which are practically straight and gently divergent; the 2nd posterior cell slightly over three times as long as broad. Halteres black, stem yellow.

Length ♂ hardly 1 millim., ♀ $1\frac{1}{3}$ millim.

Described from several specimens of both sexes in the Indian Museum, taken in the Museum gardens, Calcutta, 21. i. 10 to 24. ii. 10 (*Annandale*).

The larvæ caused much damage in the gardens by devouring lily bulbs and other plants of a like nature. The following notes have been compiled by Mr. C. Paiva, of that Institution, who observed the transformations :—

"During February 1910, I placed a number of males and some egg-laden females in a tube with a piece of a rotten lily-bulb, with the object of getting them to breed. All the flies died in the course of a couple of days. I could not find any eggs, but I kept the bulb damp and on about the 4th March I noticed a number of small thread-like worms, quite transparent, with black heads, moving about quite actively in the soft and moistest parts of the bulb. These gradually grew larger and I preserved some in spirit. On March 14th, at 10 A.M. I found the tube with a number of flies similar to those which I had placed in the tube in February for the purpose of breeding. They were very active and ran about on the sides of the tube. At first I thought they were trying to escape, but I watched them more closely and found that the males were running after the females. No difference in the size of the abdomen of the male and that of the female could be noticed when the flies were first observed, but as the day advanced the abdomen of the females gradually enlarged.

The most striking feature in the life of these little flies, seems to me to be mode of copulation. The act is effected by the male running blindly, as it were, until he approaches a female. He gets on her back and after effecting the connection, in a few seconds, gets off and being still attached to the female, struggles to release himself. No sooner has one male left a female than another male comes running along and attaches himself to the same female. In this manner I have observed several males to have connection with the same female. I have also noticed two males attempting to copulate with one female at the same time."*

100. **Sciara impostor**, sp. nov.

♂. This species has a remarkably close resemblance to *S. flavicollis*, although on account of the 1st longitudinal vein ending short of the fork of the 4th, it technically falls into the second section of the genus. The distance between the tip of the 1st longitudinal and the fork is, however, so small that the distinction may easily be overlooked, owing to the close resemblance between the two species in other respects.

The chief difference is that in *S. flavicollis*, the whole thorax, except the margin, is uniformly shining black, whereas in the present species the black colour is distinctly dull, and is composed of three contiguous, very broad, black stripes, occupying nearly all the dorsum. Moreover the central stripe is (in two out of the three specimens) dark brown at its anterior end, which, attaining

* Mr. Dale says that he has seen in England two males of a *Sciara* actually *in cop.* at the same time with a single female.

the front margin, is a little longer than the other two stripes. The 5th vein forks at a very distinctly greater distance from its base than in *flavicollis*, in which species the anterior branch is apparently disconnected at the fork.

Length 3½ millim.

Described from two males in the Indian Museum from Darjiling, 1. x. 08 (*type*) and 2. x. 08, also a male in my collection from the same locality, 10–16. x. 05 ; all three specimens taken by me.

In all other respects, except that the antennal scape is yellow, this species is identical with *flavicollis*. Although the resemblance is so close I feel sure that the forms are distinct, and tend to indicate that too much reliance must not be placed on the precise mathematical point reached by the 1st longitudinal vein.

101. **Sciara segmenticornis**, sp. nov.

♂. *Head* blackish. Palpi, scape and 1st flagellar joint pale yellow, 2nd joint brownish yellow, remainder dark brown, with grey pubescence, each joint with a short transparent bare part at the base, which gives the appearance of the joints being detached from one another. *Thorax* moderately shining light brown. *Abdomen* dark brown ; belly a little lighter. Genitalia concolorous, normal, moderately large. *Legs* pale yellowish, tibiæ and tarsi only slightly darker. *Wings* very pale yellowish grey, iridescent ; 1st longitudinal vein ending distinctly before fork of 4th and at about the middle of the wing ; petiole of 4th vein longer than the branches of its fork, which are slightly convergent in the middle. Halteres black, stem yellow.

Length 2 millim.

Type ♂ in the Indian Museum, from Bindukhera, Naini Tal district, in the plains, 13. iv. 09.

A second male in the same collection from Darjiling, 29. v. 10, taken by me, is probably the same species, but has the whole flagellum black. It is slightly larger in size.

102. **Sciara compacta**, sp. nov.

♀. Body mainly light brownish yellow. *Head* with the vertex blackish ; flagellum blackish, except the two or three basal joints. *Thorax* with the shoulders and scutellum paler yellow. *Abdomen* more brownish, the tip black ; ovipositor concealed. *Legs* : tibiæ dirty yellow, tarsi black. *Wings* with the 1st longitudinal vein ending distinctly before fork of 4th and exactly at middle of wing ; branches of 4th nearly as long as petiole, parallel, a little curved. Halteres blackish brown, stem yellow.

Length 2¼ millim.

One example (*type*), from Gangtok, Sikkim, 6150 ft., 8. ix. 09 ; and a second from Butal, Nepal, 12. ii. 08, this latter being a little more brownish in colour. Both in the Indian Museum.

103. Sciara inconspicua, sp. nov.

♀. *Head* blackish; palpi pale yellow, also the scape and the two or three basal joints of the flagellum. *Thorax*: dorsum almost wholly occupied, except at the shoulders and humeri, by three contiguous broad, rather dark chestnut-brown stripes, with two greyish, barely perceptible lines separating them. Pleuræ, metanotum, and scutellum concolorous; the latter pale yellow below, and with six rather long moderately strong bristly hairs and two or three smaller ones towards each side. *Abdomen* dark nut-brown, pubescent, hind margins of segments narrowly cream-yellow; belly yellowish. Ovipositor small, dark brown. *Legs*: coxæ and femora pale yellow, a little blackish at their junction, tibiæ and tarsi darker. *Wings* pale yellowish grey; 1st longitudinal vein barely reaching as far as fork of 4th, ending almost exactly at the middle of the wing; branches of 4th about equally long as the petiole, nearly straight, parallel; 2nd posterior cell nearly four times as long as broad. Halteres brownish.

Length 3 millim.

Described from a single female in the Indian Museum from Sylhet, 14. i. 05 (*Lt.-Col. Hall*).

This species is placed in my synoptical table between the two groups 17 (thorax mainly yellowish) and 24 (thorax mainly blackish or brown).

104. Sciara hirtilineata, sp. nov.

♂ ♀. *Head* blackish. Tip of 2nd scapal joint narrowly reddish yellow; flagellar joints rather elongate. *Thorax* black, dull, with two median narrow grey stripes close together, from the anterior margin nearly to the scutellum; two broader stripes commencing behind the shoulders and continuing nearly to the posterior margin; this gives an appearance of three obvious but not conspicuous blackish lines on a dark background, but in occasional specimens they are almost or entirely absent, in which case the three rows of pale hairs will generally identifiy the species. Three longitudinal stripes of rather closely and irregularly placed, moderately long, brownish yellow hairs; the central hairy stripe between the two median narrow grey stripes, the other two hairy stripes between these median grey stripes and the lateral wider grey stripes; lateral borders of dorsum with similar brownish yellow hairs, but without distinct bristles; a little yellow pubescence about the shoulders, below which is a small reddish yellow mark. Scutellum blackish, with soft brownish yellow hairs only; metanotum blackish. *Abdomen* dull black, with brownish yellow hairs, and hind margins of segments very narrowly reddish yellow; belly blackish. Genitalia in male large, normal; in female telescopic, elongate. *Legs*: coxæ and femora brownish yellow, the former darker at base; tibiæ rather dark

brown, with red-brown spurs; tarsi darker brown or blackish. *Wings* pale grey: 1st longitudinal vein ending much before fork of 4th, exactly at the middle of the wing; petiole of 4th equal in length to its branches, which are nearly straight, parallel or very slightly diverging; 2nd posterior cell three and a half times as long as broad. Halteres yellowish.

Length 2¼ millim.

Described from one male and several females in the Indian Museum, taken by Dr. Annandale and others. The male (*type*) from below Phagu, 7000 ft., Simla district, 12. v. 09; the females from Simla, 7000 ft., 10. v. 09; Darjiling, 7000 ft., 6. viii. 09; Kurseong, 5000 ft., 4. vii. 08.

105. Sciara niveiapicalis, sp. nov.

♀. *Head*: vertex and face smooth, shining black, with a few short brownish yellow hairs. Palpi yellow; antennal scape brown, flagellum black, with grey pubescence; last four joints wholly white. *Thorax* shining black, smooth, bare or practically so; a few stiff hairs above the wings. Pleuræ, scutellum and metanotum concolorous, scutellum (apparently) with only a few soft hairs. *Abdomen* black, moderately shining, roughened, traces of yellow on the hind margins of one or two segments; the last two segments (in type) or three (in second example) pale yellow; underside of abdomen with middle segment yellow. Ovipositor blackish, with rather elongate terminal lamellæ. *Legs*: coxæ and femora yellow; tibiæ dirty brownish yellow, tarsi nearly black. *Wings* very glassy and iridescent, reaching distinctly beyond the tip of the abdomen; 1st longitudinal vein ending some distance before fork of 4th, barely attaining middle of wing; petiole of 4th equal in length to the branches which very slightly diverge before their middle and again on the wing-margin; 2nd posterior cell three and a half times as long as broad. Halteres with yellow stems and black clubs.

Length 2 millim.

Described from two females in the Indian Museum taken at Ukhrul, Manipur, 6400 ft. (*Pettigrew*).

The very conspicuous white-tipped antennæ render this species easily recognisable from all others in the East.

106. Sciara longipennis, sp. nov.

♂ ♀. *Head* wholly black, except the palpi, which vary from yellowish to nearly black, and the tip of the 2nd scapal joint and base of 1st flagellar joint of the antennæ, which are sometimes yellowish. *Thorax* black, practically bare, with slight traces of three dorsal rows of minute hairs; anterior or posterior corners of dorsum in some specimens yellowish brown. Scutellum and metanotum black. *Abdomen* mainly black, dull, the dorsum of the

segment sometimes dull brown; belly varying from dirty brown to black. Genitalia composed of a small dorsal plate, a little larger ventral one, a normal, rather large pair of claspers, the 2nd joint ending in a thick bifid tip, and an intermediate pair of small organs. Ovipositor brownish yellow or dark brown, of considerable length, ending in the two usual conspicuous lamellæ. *Legs*: coxæ and femora yellowish; the latter often with a small distinct black spot below, at the base; tibiæ brown, tarsi darker. *Wings* very pale grey, yellowish at base, reaching some distance beyond the tip of the abdomen, but apparently varying in length a little. The 1st longitudinal vein ending distinctly but not much before the fork of the 4th, and barely reaching the middle of the wing; the 3rd vein somewhat close to and parallel with the costa, thus being rather more curved than in most species; petiole of 4th vein about equal in length to the branches, which curve a little, diverging slightly at their tips; the 2nd posterior cell three to three and a half times as long as broad. Halteres black, stem more or less yellowish.

Length $1\frac{3}{4}$–$2\frac{1}{4}$ millim., including ovipositor.

Described from a type male from the valley of the Sutlej River, below Simla, 6. v. 10 (*Annandale*); two additional males from Kurseong, 26–27. vi. 10 (*Annandale*), and a male from Darjiling, 28. v. 10 (*Brunetti*); two females taken by me at Darjiling, 25. v. 10 (*type*) and 28. v. 10, respectively, also from other females from Simla, 6. v. 10 (*Annandale*); Kurseong, 4. vii. 08 (*Annandale*), and Tonglu, Darjiling district, 10,000 ft., 22. iv. 10 (*C. W. Beebe*).

Types ♂ and ♀ (with the other specimens mentioned) in the Indian Museum.

This species, as represented by the male and four females before me, appears variable in the colour of the palpi, the colour at the union of the scape and flagellum and in the corners of the dorsum of the thorax, and in the length of the wings, but the variations exhibited appear all to fall within the range of a single species.

107. Sciara flaviseta, sp. nov.

♀. *Head* black, except the brownish yellow palpi and yellowish scape. *Thorax* dull black, with three rows, towards the middle, of irregular brownish yellow hairs, and with similar hairs laterally. Scutellum black, with four long yellow bristles and also two or three shorter ones on each side. *Abdomen* blackish brown, pubescent; belly and ovipositor similar. *Legs* brownish yellow, tibiæ and tarsi dark; posterior femora with a small black spot below at base. *Wings* nearly clear, iridescent; 1st longitudinal vein ending distinctly before fork of 4th, barely reaching middle of wing; petiole of 4th about as long as the branches, which gently diverge. Halteres yellow.

Length $1\frac{3}{4}$ millim.

Described from one female from Simla, 10. v. 09 (*Annandale*), in the Indian Museum.

A second specimen from the same source in the collection is probably identical. Two others from Darjiling, 26. v. 10 (*Brunetti*) and Tonglu, Darjiling district, 21. iv. 10 (*Beebe*), are very close to *flaviseta*, but being almost destitute of scutellar stiff hairs and in inferior condition generally, opinion on them may be reserved.

108. **Sciara nitidithorax**, sp. nov.

♂. *Head* wholly dull blackish; antennæ with the extreme edge of the 2nd scapal joint whitish yellow; flagellum normally with thick grey pubescence. *Thorax* very shining black, bare except for three very narrow dorso-central bands of very short bristly hairs. There are stiff hairs laterally and at least two (perhaps four) strong bristly hairs on the hind margin of the scutellum, in addition to some shorter ones; sides black. Scutellum and metanotum wholly black, the former with a slight dark brown tinge. *Abdomen* blackish, with some pale hairs towards the sides; extreme margins of segments pale yellow; belly black. Genitalia large, black, normal. *Legs* wholly dark brown. *Wings* pale grey; 1st longitudinal vein ending distinctly before middle of wing and some distance before fork of 4th vein; the 3rd vein ending some distance before the tip of the wing; the costa ending halfway between the tips of the 3rd vein and the anterior branch of the 4th; petiole of 4th vein barely as long as the branches, which are nearly parallel; the 2nd posterior cell three and a half times as long as broad. Halteres black.

Length $1\frac{1}{2}$ millim.

Described from one male from Kalighat, 6000 ft., Garhwal district, 4. vi. 10 (*Imms*).

Type in the Indian Museum.

109. **Sciara longitudinalis**, sp. nov.

♂. *Head* wholly black, including the antennæ, except for a suspicion of paleness about the scapal joints of the latter; sometimes the antennæ, seen through a microscope, appear dark brown; the segments of the flagellum well separated, with rather thick grey pubescence. Palpi dark dirty yellowish grey. *Thorax* black, shoulders and edges of dorsum generally rather pale brownish yellow. Scutellum brownish yellow, with two moderately conspicuous longer bristles and some short stiff hairs; metanotum blackish. *Abdomen* dark blackish grey or brown; hind margins of segments irregularly blackish; with soft pale hairs; belly similar. Genitalia of male of moderate or rather large size, brownish yellow or blackish brown, hairy, normally shaped, the intermediate appendage distinctly bilobed. In the female the ovipositor terminates in two distinct elongated flat lamellæ. *Legs* pale yellowish; tibiæ brownish yellow, tarsi blackish yellow. *Wings* somewhat broadened on the distal part of the anterior margin; the 1st longitudinal

vein ending a little before the middle of the wing, its exact length not constant, but terminating distinctly before the fork of the 4th; the 3rd vein much longer than usual, continuing nearly to the tip of the wing, parallel with the costa for its whole length except at its tip; petiole of 4th vein about equal in length to the branches, which are nearly parallel, or a little divergent at their tips; 2nd posterior cell three or four times longer than broad. Halteres blackish.

Length 2 millim.

Described from a type male from Kurseong, 8. vii. 08, and a type female from Darjiling, 28. v. 10, the latter captured by myself; also from four males from Tonglu, Darjiling district, 10,000 ft., 22. iv. 10 (*Beebe*): all the specimens in the Indian Museum.

110. **Sciara ruficoxa**, sp. nov.

♀. *Head* blackish; 2nd scapal joint and base of 1st flagellar joint brownish yellow; proboscis black; palpi with basal part reddish yellow, apical part black. *Thorax* dull black, with stiff bristly hairs towards sides and on hind margin of the concolorous scutellum; metanotum and sides of thorax dull black. *Abdomen* black, with black hairs; hind margins of segments rather narrowly pale whitish yellow. Ovipositor conspicuous, elongated, normal. *Legs*: coxæ bright reddish yellow, tips blackish; femora bright yellowish, base blackish; tibiæ and tarsi brown. *Wings* grey, highly iridescent; the 1st longitudinal vein barely reaching middle of wing, distinctly short of the fork of the 4th, the branches of which are parallel; the 2nd posterior cell four times as long as broad; the 3rd vein nearly parallel with the costa, ending a little before the wing-tip. Halteres black.

Length 3 millim., including ovipositor.

Described from a single female taken by Dr. Annandale at Kurseong, 25. vi. 10.

Type in the Indian Museum.

111. **Sciara flavipleura**, sp. nov.

♂ ♀. *Head* black; ocelli very large; antennal scape pale yellow, basal joints of flagellum more or less yellowish; palpi pale yellow. *Thorax*: dorsum black, shoulders and posterior corners broadly, the lateral edges narrowly, bright pale yellow; sides of thorax wholly bright pale yellow. Two well separated dorso-central rows of moderately large bristly hairs, and a lateral row, below which are several much stronger ones in the neighbourhood of the wings, and two on the posterior corners. Scutellum blackish, yellow below, with four long strong bristles of equal length, and some very short softer ones on each side of these; metanotum moderately dark brown. *Abdomen* dark brown, with black pubescence; belly a little lighter. Genitalia concolorous,

pubescent; 2nd joint broadly dentate, intermediate organ bilobed Ovipositor of female small, simple, brown. *Legs*: coxæ and femora pale yellow, latter with a small black spot below at base; tibiæ and tarsi brownish, the latter darker. *Wings* pale grey, iridescent; 1st longitudinal vein ending much before fork of 4th and distinctly before middle of wing; petiole of 4th about equal to branches, which gently diverge; 2nd posterior cell a little over three times as long as broad. Halteres yellow.

Length $1\frac{3}{4}$–$2\frac{1}{4}$ millim.

Described from a type male, Darjiling, 2. x. 08 (*Brunetti*), and a type female, Darjiling, 6. viii. 09 (*Paiva*), and a second female, Kurseong, 3. ix. 09 (*Annandale*); all in the Indian Museum.

112. Sciara evanescens, sp. nov.

♂ ♀. *Head* black, palpi yellowish. *Thorax* black, shoulders a little yellowish. Dorso-central and lateral bristles moderately large. Scutellum black, with two long bristles. *Abdomen* blackish brown, hind margins of segments a little blacker. Genitalia in both sexes normal, concolorous, but of considerable size in the female. *Legs* pale yellowish; tibiæ a very little darker; tarsi dark brown. *Wings* nearly clear; in certain lights with brilliant violet iridescence; 1st longitudinal vein ending distinctly before fork of 4th, barely reaching middle of wing; petiole a little shorter than the branches of 4th, the latter gently diverging; 2nd posterior cell three times as long as broad. Halteres yellow.

Length 2 millim.

Described from six males and three females in the Indian Museum; the type male from Simla, 9. v. 09 (*Annandale*); the type female from Calcutta, 25. ii. 09 (*Annandale*); other specimens from Darjiling, 6. viii. 09 (*Paiva*), and Peradeniya, Ceylon, 14. vii. 10, 7. viii. 10.

Under the present species are grouped a number of specimens which show considerable similarity, but which, on further study of a larger amount of material, may prove to comprise more than one species. But for the much shorter 1st longitudinal vein, these insects might almost be united with *S. orientalis*, and in any case their natural affinities appear to be certainly with that species.

113. Sciara parallela, sp. nov.

♂ ♀. *Head* black, except the yellow palpi and the basal part of the first flagellar joint of the antennæ. *Thorax* black, shoulders yellowish; with traces of dorso-central and some lateral stiff hairs. Scutellum brown, yellowish below, with four long apical bristles and some shorter ones; metanotum blackish; sides of thorax blackish. *Abdomen* blackish brown or dark brown, hind margins of segments more or less pale, and on the belly also. Ovipositor concolorous, of considerable size, the basal joint being nearly as large as in the males of many species; the second joint

considerably smaller, and in addition there are the usual oval, fairly large, terminal lamellæ. *Legs*: coxæ and femora yellowish, tibiæ darker, tarsi dark brown. *Wings* nearly clear; the 1st longitudinal vein ending distinctly before, but approximate to, the fork of the 4th vein, and at about the middle of the wing; petiole of the 4th vein a little shorter than the branches, which are parallel; 2nd posterior cell about four times longer than broad. Halteres yellowish.

Length 2–2½ millim.

Described from a single type male from Simla, 9. v. 09 (*Dr. Annandale*), and two females both taken by me at Darjiling, 2. x. 08 (type) and 26. v. 10.

Types in the Indian Museum.

A third female in the same collection taken by me at Darjiling, 26. v. 10, evidently belongs also to this species. It has the 2nd scapal joint wholly yellow, and the ovipositor is not conspicuous, but appears to be withdrawn, the lamellæ only protruding.

Family BLEPHAROCERIDÆ.

A family of very limited extent, composed of rather small, delicate flies, with slender bodies and long slender legs; the insects conspicuous chiefly by a so-called "secondary" venation, which

Fig. 12.—*Blepharocera* (after Kellogg).

consists merely of the folds or creases in the wing which have not been obliterated after emergence from the pupal stage. They frequent small rocky streams in woods in hilly and mountainous countries.

The eyes exhibit very characteristic peculiarities and have been

the subject of study by more than one author. The usual sexual distinction in the comparative width of the frons, which obtains in a great many families of Diptera, does not hold good in the BLEPHAROCERIDÆ. The head is usually dichoptic in both sexes, but occasionally it is holoptic in one or both sexes. The eyes "are usually bisected by an unfacetted cross-band or line separating each eye into two fields, an upper and a lower one; the upper composed of larger and less pigmented ommatidia (large and brown facets); the lower composed of smaller and more strongly pigmented ommatidia (small black facets). In a few species the eyes are bisected only in one sex. Three rather large ocelli are present" (Kellogg). The upper eye faces dorsally and is composed of large facets, the lower one faces ventrally, anteriorly and laterally, and is composed of much smaller facets. Radical structural differences exist in addition between the upper and lower eye.*

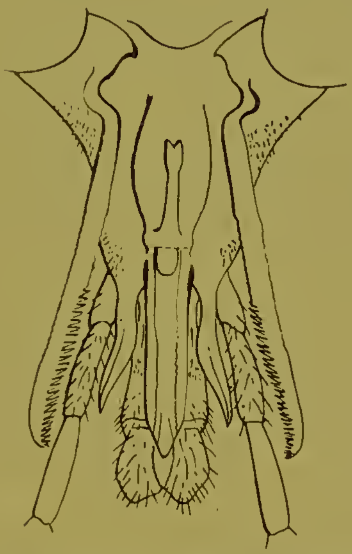

Fig. 13.—Mouth-parts of a Blepharocerid, *Bibiocephala doanei*, Kellogg (after Kellogg).

The mouth-parts are complex, elongated, "the female having in addition to labium and maxillæ, slender flattened elongate, saw-like mandibles; the males are without these mandibles. Both sexes have a slender elongate labrum-epipharynx, a similar slender elongate hypopharynx, a pair of slender blade-like maxillæ, with 5-segmented palpi, and labium with slender elongate basal sclerite, and a pair of free fleshy terminal lobes without pseudotracheæ and with palpi" (Kellogg).

* For studies on eyes of this divided character in other groups of animals, reference can be made to "The divided eyes of Arthropods" by Kellogg, Zool. Anzeig. (1898). Zimmer (Zeits. f. wiss. Zool. lxiii, pp. 236–262, 1898) on the eyes of EPHEMERIDÆ may also be consulted.

The antennæ are composed of the usual two basal (scapal) joints and a usually elongate cylindrical flagellum of from nine to fifteen joints, which are shortly pubescent. In some genera the flagellum is shorter and relatively more robust.

Body practically bare; thorax with transverse suture distinct, broadly interrupted. The abdomen slender, generally of uniform width. The male genitalia reach their greatest complexity in *Bibiocephala*, and are most simple in *Blepharocera*. In the former the principal pair of claspers is two-jointed, the second joint represented by two elongate, pliable, finger-like pieces. There are apparently (judging from Kellogg's plate) two other pairs of subconical elongate claspers; a small ventral plate, bi-emarginate on the posterior margin, and an intermediate, rather robust organ. The female genitalia consist mainly of a pair of small rather blunt lamellæ.

The legs are long and slender, the hind pair much longer than the others. In some species the fore femora are curved in the male; the tibiæ may or may not possess terminal spurs; the claws small, and the empodia small or rudimentary; pulvilli absent.

Venation generally incomplete. The auxiliary and 1st longitudinal veins are united, unless one or the other is considered to be absent. The 2nd longitudinal vein is simple or forked; when the latter, the forking always occurs towards the tip; 3rd longitudinal vein present or absent; in the latter case the anterior cross-vein connects the 2nd and 4th longitudinal veins. Anterior cross-vein generally present, often appearing to be the origin of either the 2nd or the 3rd vein. The 4th longitudinal vein apparently always present; a lower branch of it often present, but with the basal half of this branch obliterated. This is what Kellogg calls an incomplete media. The 5th longitudinal vein present, simple or forked; posterior cross-vein present or absent; 6th longitudinal vein present or absent. No discal cell.

As to cells: in the genus *Philoris*, in which the venation reaches its greatest development, there is a costal cell, marginal, submarginal, 1st, 2nd and 3rd posterior cells (the 2nd being distally divided by the incomplete branch of the 4th vein); an anal and an axillary cell. Anal lobe of wing generally well developed, often exceptionally so (*Philorus*, *Bibiocephala*, *Blepharocera*); sometimes it is absent (*Paltostoma*). Alulæ, properly speaking, absent, tegulæ always absent. Halteres well developed.

Life-history. The larvæ of all known species live in clear, running, highly aërated streams, where they fix themselves with great tenacity to the sides of the rocks, preferring those spots where the stream flows fastest, and they occur almost exclusively in mountainous or hilly regions. They travel slowly and mainly in a lateral or sideways direction. The larva consists of a head segment (which is composed of the fused head and three thoracic segments united), and five body segments, the last one formed of the two anal abdominal segments united, but with an intervening

constriction. All the segments are very strongly constricted at the base and apex, so as to present the extraordinary appearance of thick rings strung on a central axis. Under each of the segmental parts is a single pad-like foot, locomotion being effected by releasing the fore or hind three and moving slightly to right or left, the remaining three following suit after the first three have attached themselves again.

The pupa is ovate, strongly convex on the upper side, its lower side being quite flat; it lies quiescent, sticking to the rocks permanently by means of its six pads. "The wings and legs lie folded on the ventral aspect (side), which is covered only by a thin colourless pupal cuticula. From the prothorax project dorsally a pair of respiratory organs, each composed of a thin double-walled plate, the outer plates of each set being strongly chitinized, and acting as protecting covers for the two delicate membranous inner ones ; (the whole arrangement like a two-leaved book, with board covers)" (Kellogg). "The pupa is formed within the larval skin, but the latter is subsequently cast, so that the pupa is exposed ; its dorsal region is horny, but the under surface by which it clings firmly to the stones of the rapid brook, is white and scarcely chitinised, and Dewitz considers that the chitinous exudation from this part is used as a means of fastening the pupa to the stones" (Dr. Sharp, 1899).

The emergence of the imago from the pupa is very interesting and has been observed by Comstock and by Kellogg; the former thus describing it:—

"Each midge on emerging, forced its way out through a transverse rent between the thorax and abdomen. It then worked its body out slowly, and in spite of the swift current held it vertical. The water covering the patch of pupæ varied from one-fourth to one-half inch in depth. In the shallow parts the adult had no trouble in working its way to the surface, still clinging to the pupa skin by its very long hind legs. While still anchored by its legs, the midge rests on the surface of the water for one or two seconds and unfolds its wings; then freeing its legs it takes flight. The adults emerging from the deeper water were swept away by the current before they had a chance to take wing. The time required for a midge to work its way out of the pupa-skin varied from three to five minutes."

For information on the life-history of some non-Oriental species the following authors may be consulted :—Dewitz (Berlin. Ent. Zeits. xxv, p. 61, 1881), and Brauer (Wien. Entom. Zeit. 1882), on the European *Liponeura brevirostris*; and Müller (Arch. Mus. Rio Jan. iv, p. 47, 1881), on a species of either *Paltostoma* or *Curupira*; Osten Sacken (Berl. Entom. Zeits. xl, p. 148, 1895), also adds interesting notes.

The perfect insects frequent their breeding grounds, the rocky swift flowing streams of hilly regions, lying flat on the vertical sides of the damp rocks, and occur in greatest abundance on sunny days. Their flight is weak. The male is apparently not predatory;

the female feeds on the body-juices of small CHIRONOMIDÆ, which are caught on the wing. The male seems rarer than the female as a rule, but Bezzi records the opposite concerning a subalpine Italian species, *Hapalothrix lugubris*, Lw. This species has been observed to pair upon the surface of the water.

The BLEPHAROCERIDÆ may generally be distinguished without much difficulty from all other families of NEMATOCERA either by the so-called secondary venation or the lateral bisection of the eyes.

Only nine genera are known, representing nineteen species, including my two new ones, and of these three genera are found in India or Ceylon. They may be thus distinguished :—

Table of Genera.

The incomplete lower branch of the 4th longitudinal vein absent.	
The 2nd and 3rd longitudinal veins absent	HAMMATORHINA, Loew, [p. 152.
The 2nd vein present, 3rd absent	APISTOMYIA, Big., p. 153.
The incomplete lower branch of the 4th longitudinal vein present	BLEPHAROCERA, Macq., [p. 155.

Hammatorhina is placed by Loew in a table as follows, and this appears to afford the only definite characters by which he separates it.

A. Labrum moderately short, with short hairy labella.	
B. Eyes nearly contiguous in both sexes, the upper facets very large.	BLEPHAROCERA, Macq.
BB. Eyes in one or the other sex wide apart; upper facets uniform in size with the lower ones	LIPONEURA, Loew.
AA. Labrum extremely long, with very long labella, filiform, bare.	
C. Eyes divided by a broad front; five longitudinal veins	APISTOMYIA, Big.
CC. Eyes nearly contiguous; four longitudinal veins................	HAMMATORHINA, Loew.

Genus HAMMATORHINA.

Hammatorhina, Loew, Bull. Soc. Ent. Ital. i. p. 94 (1869).

GENOTYPE, *H. bella*, Lw., the original and only species.

I am unacquainted with this genus, and append a translation of Loew's description of his species.

114. Hammatorhina bella, *Lw.*

Hammatorhina bella, Loew, Bull. Soc. Ent. Ital. i. p. 96, pl. ii, figs. 4-6 (1869).

"Velvet-black, thorax and abdomen with silvery spots ; length

of body $1\frac{1}{2}$ to 2 lines. Velvet black. Head, proboscis and antennæ black; frons dusted with silvery white. Thorax on each side above with a white mark in the shape of a hook, of which the broader and shorter part is situated on the transverse suture, and the longer and thinner part reaches to above the base of the wings. Pleuræ dull blackish, with four large shining white spots, of which

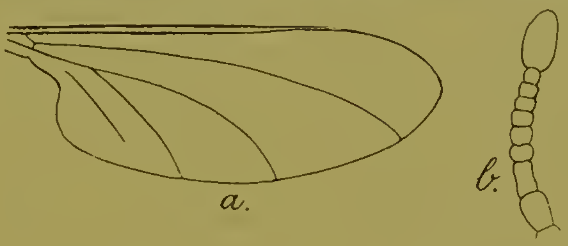

Fig. 14.—*Hammatorhina bella*, Lw.; *a*, wing; *b*, antenna (after Kellogg).

one is placed higher than the others, in front of the base of the wing, the three others being lower, and in a horizontal row. On each abdominal segment is a very large triangular spot reaching nearly to the posterior margin, and of a shining pearl colour, with brilliant shining silvery reflections. Hypopygium velvet black, only the claspers a little paler, the last joint of simple structure. Legs blackish; femora brownish yellow towards the base. Halteres brownish yellow with black clubs. Wings hyaline, moderately large, costa very black, the longitudinal veins blackish, the 1st longitudinal thicker, the rest distinctly less strong, the last one not attaining the border of the wing."

Length 3–4 millim.

Ceylon.

Genus APISTOMYIA, *Big.*

Apistomyia, Bigot, Ann. Soc. Ent. France, (4) ii, p. 109 (1862).

Genotype, *A. elegans*, Big., the original and only other species.

Head very rounded; eyes pubescent, separated in both sexes by a broad frons, and divided by an unfacetted band, as in *Blepharocera*, separating the large upper facets from the small lower ones; three ocelli. Palpi probably 5-jointed.* Antennæ of nine (?) or ten joints, barely longer than the head, bare; 1st scapal joint short, 2nd much longer; flagellum of seven (?) or eight joints. of which the first is the longest, the last ovate, and the intermediate ones short

* In his text Bigot says that the palpi are three-jointed (adding that they were not clearly visible), but in his illustration the palpi are five-jointed and exceedingly long, and Kellogg reproduces this figure. In my new species I can only assume that these organs have been broken off; otherwise it possesses only *one*-jointed palpi, a complete anomaly, which would of course necessitate a new genus.

and moniliform.* Proboscis very thick at base, rapidly diminishing to a sharp pointed rostrum (two points in *elegans*); the tongue much longer, very slender, bifid at tip (*elegans*) or just beyond the middle (*indica*), normally straight (geniculated in *indica*). *Thorax* moderately arched. *Abdomen* slender, 6-segmented; genital organs not conspicuous. *Legs* very long, especially the hind pair; tibiæ unspurred, metatarsus much elongated, claws simple, long. *Wings* broad, anal angle distinct, tips rounded; 1st longitudinal vein very close to costa, ending at three-fourths the length of the wing; 2nd vein beginning at a very acute angle at a quarter of the wing's length, the anterior cross-vein placed at or so close to its origin that both appear to emerge simultaneously, the cross-vein slanting backwards very considerably, joining the 4th vein quite near the base. The 2nd vein is bisinuate, ending just beyond the tip of the 1st vein, at some distance from the wing-tip; the 4th vein straight for two-thirds of its length, thence suddenly curving downwards, ending about opposite the tip of the 2nd vein; 5th vein forked at base, the branches widely diverging, well curved; 6th vein distinct to the wing-margin, curved.

Range. The only previously known species, *A. elegans*, comes from Corsica and Cyprus.

Life-history. Unknown, but probably closely identical with that of *Blepharocera*.

115. **Apistomyia trilineata**, *Brun.*

Apistomyia trilineata, Brunetti, Rec. Ind. Mus. iv, p. 315 (1911).

♂. *Head*: eyes closely, microscopically pubescent, upper facets very distinctly larger than lower ones, divided by a distinct narrow space, the upper ones being about one-fourth the total height of the eyes. Frons one-third the width of the head, bare, the eye-orbits narrowly silvery; ocellar triangle distinct, elevated, the three ocelli conspicuous, reddish brown. Face whitish grey, with silvery reflections. Antennæ black, bare; 1st scapal joint much broader at tip than at base, 2nd joint twice as long as the 1st, much broadened at tip, where it is produced on the under-

* The expression "antennæ of nine or ten joints" is not intended as defining the precise generic limits of this character, but merely indicates that there seems much uncertainty about them. Bigot, in his original text, gives nine joints; the 1st short, the 2nd much longer and thicker, the 3rd to the 8th small, the last joint ovate. However, in his figure he shows only eight joints, one of the moniliform joints having been omitted. Kellogg (Gen. Ins.) in his figure (Pl. I, fig. 3) of *A. elegans*, Big. ("after Schnuse") shows an additional small scapal joint. This is almost certainly incorrect. Then in Pl. II, fig. 16 (*A. elegans*, Big., "after Bigot") an antenna of ten joints is shown, of which the scapal joints are in conformity with Bigot's description and figure, whilst seven flagellar joints are shown irrespective of the ovate apical joint, and of these seven, the first three are larger than the remaining four. It is obvious that the two antennæ given in the two plates cannot represent the same species. In my *A. indica* ten joints are very plainly present.

side into an elongate blunt point. Flagellum of eight joints, the 1st barely half as long as the 2nd scapal joint, the following joints shaped like thickened beads, the apical joint ovate. The proboscis consists of a long elongate-conical rostrum, moderately stout at the base, whitish in colour, with blackish dorsum, thence produced into a tapering, very sharply pointed, brownish yellow, horny piece (quite separate from the proboscis proper), which is very long, black, narrowly cylindrical and geniculated before the middle, beyond which it is bilobed, the ends being curled up. *Thorax* ash-grey, the central part of the dorsum up to beyond the middle occupied by three broad velvet-black stripes, nearly contiguous, extending laterally almost to the sides; the median stripe produced forwards to the anterior margin, which is wholly black to the shoulders, leaving a narrow grey space in front. Pleuræ, scutellum, and metanotum blackish. *Abdomen* velvet-black, the anterior corners of most of the segments a little reddish brown, with more or less silvery reflections. Belly reddish brown. Genitalia moderately small, oval, blackish, not conspicuous. *Legs*: coxæ wholly and the femora more or less at the base, brownish yellow; remainder of anterior legs blackish; tibiæ and tarsi of hind legs brownish yellow, extreme tips of joints black. Anterior femora distinctly clubbed at the tips, the hind femora moderately thickened apically; the hind femora and tibiæ each twice as long as the anterior ones, and the hind tarsi fully as long as the hind tibiæ. *Wings* absolutely clear, costa very narrowly black; a small brownish infuscation at extreme tip of wing. Venation normal, agreeing with Kellogg's figure.* Halteres black, stems yellowish.

Length 4 millim.

Described from a single specimen in the Indian Museum, taken by Dr. Annandale at Kurseong, 5000 ft., 4. ix. 09, moving sluggishly on blades of grass.

Genus BLEPHAROCERA, *Macq.*† (Pl. XII, figs. 18, 19.)

Blepharicera, Macquart, Ann. Soc. Ent. France, (2) i, p. 61 (1843).
Asthenia, Westwood, Guérin's Mag. de Zool. (2) iv, pl. xciv (1842), (preoccupied).

Genotype, *Asthenia fasciata*, Westw. (as *limbipennis*, Macq.).

Head transverse, flattened above, rounded in front, as wide as thorax in male, narrower in female; epistoma produced into a snout. Proboscis of moderate size. Palpi long and prominent, of four subequal joints.‡ Eyes pubescent; in male with large upper facets facing vertically and very small ones below facing

* Gen. Ins., Fasc. 56, pl. ii. fig. 20.
† Emended by Loew (1862).
‡ In Kellogg's figure (Gen. Ins.) six very distinct joints are shown. Macquart and Schiner give four, and there are certainly only four in *B. indica*.

laterally, the two kinds separated by a distinct though narrow unfacetted band; in female, widely separated, the frons of uniform width; three ocelli. Antennæ of fifteen joints, the two scapal ones slightly differentiated.* *Thorax* moderately arched, narrowed in front; the transverse suture obvious. Scutellum semicircular. *Abdomen* of seven or eight segments, long and narrower than thorax; in male slightly curved, with clubbed tip, the genitalia moderately prominent; in female less curved and thicker, with short ovipositor. *Legs* very long and thin, two or three times as long as the whole body, hind pair much the longest; tibiæ with minute spurs; metatarsus as long as or longer than the rest of the tarsal joints together, and in the male with some short bristles below at base; 4th tarsal joint shorter than 5th, the latter in both sexes with some bunches of minute bristles below; claws long. *Wings* quite broad, tips rounded, anal lobe very large and angular; costa ending at tip of 3rd vein. The 1st longitudinal vein, with which the auxiliary vein is united, very close to the costa; the 2nd vein beginning before the middle of the wing and barely divergent from the 1st, ending a little beyond it and towards tip of wing; 3rd beginning very soon after the 1st at a sharp angle, ending at tip of wing, gently curved; anterior cross-vein at the angle of the 2nd, slanting backwards, of moderate length; 4th vein beginning at base of wing, forming a gentle curve, the lower branch incomplete for some distance at the base; 5th vein forked at one-third of its length, the branches widely diverging; 6th vein nearly straight, complete. The 4th, 5th, and 6th veins spring almost simultaneously from a common stem quite near the base of the wing; posterior cross-vein absent; squamæ absent. Halteres long.

Range. Previously known only from Europe and North America

Life-history. The papers by Dewitz, Kellogg, Weirseijski and some others may be studied. The larvæ and pupæ live in clear swiftly running water attached to the edges of projecting rocks or stones over which the stream constantly flows. The imagos seldom stray far from their breeding places. From Kellogg's observations the life-cycle seems to take a month. The females feed on the body-juices of small CHIRONOMIDÆ, the food of the male is not known.

116. **Blepharocera indica**, *Brun.*

Blepharocera indica, Brunetti, Rec. Ind. Mus. iv, p. 316 (1911).

♂ ♀. *Head:* frons narrow,† dark grey or blackish; ocelli

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* Kellogg (*l. c.*) shows 17 joints. Macquart originally gave "? 16." In *B. indica* the last joint is constricted somewhat near the tip, which might give the appearance of a minute 16th joint.

† The head in each of the examples is either damaged or shrunken in drying, so that the proportionate width of the frons is not easily gauged. It is apparently quite narrow.

large and conspicuous; face whitish. Proboscis brownish yellow, blackish at the base on upper side; elongate, pointed, about as long as the height of the head. Palpi elongate, four joints of about equal length; pale brownish yellow, with some stiff black hairs. *Thorax*: dorsum blackish; sides, scutellum, and meta-notum brownish yellow; a very small yellowish mark behind each shoulder. *Abdomen* blackish; the base of each segment very

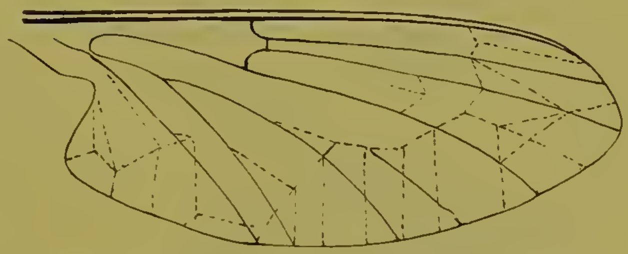

Fig. 15.—Wing of *Blepharocera indica*, Brun.

narrowly yellowish white. Genitalia inconspicuous. *Legs* brownish or brownish yellow; the hind femora slightly thickened towards the tips, about one and a half times as long as the anterior femora. *Wings* very pale yellowish grey; unmarked; venation normal. Halteres: stem yellowish, club black.

Length 4–5 millim.

Described from two males and a single female in the Indian Museum from Phagu, 9000 ft., Simla district, 12–15. v. 00, taken by Dr. Annandale. He found this species not uncommonly on bath-room windows in the Phagu "dak bungalow."

Both sexes are presumed to be present from the appearance of the abdomens, which, in the two examples I consider to be males, are blunted, with an exceedingly small projecting piece; and in the supposed female the abdomen is widened before the tip, with a short pointed ovipositor-like termination.

Family BIBIONIDÆ.

The Bibionidæ are the most robust of the Nematocera, and their heavier bodies, shorter and stronger legs, comparatively short, non-filamentous antennæ, and broad strong wings assist to differentiate them from the ordinary nematocerous type. The contiguity of the eyes in the males is another important character which separates them easily from such families as the Tipulidæ, Mycetophilidæ, Chironomidæ, Culicidæ, and so on. Their general appearance, to a beginner, may seem similar in many

respects to that of the LEPTIDÆ, among the BRACHYCERA, but the very different venation and antennæ, and the form of the anal cell (wider at the distal end than at the proximal) will at once indicate that they belong to the NEMATOCERA. They are practically world-wide in their distribution, a good number of them being vernal or autumnal in their appearance.

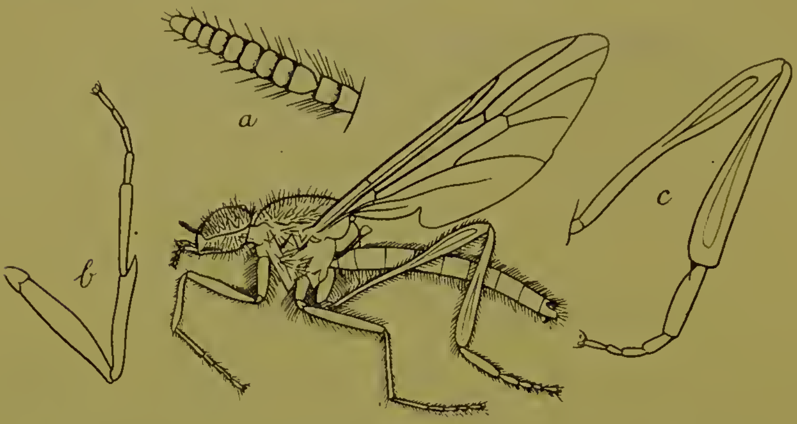

Fig. 16.—*Bibio obscuripennis*, Meij.; *a*, antenna; *b*, fore leg; *c*, hind leg.

Head generally much flattened, in *Bibio* conspicuously so, sometimes appearing more nearly horizontal than perpendicular. Eyes rounded or reniform, irrespective of sex; the upper facets in the male much larger than the lower ones, the two kinds sharply demarcated. Eyes in male very large, often occupying nearly the whole of the head; contiguous or practically so; in many species densely pubescent. In the female, the eyes are much smaller, wide apart, the frons sometimes being half the entire width of the head, sparsely hairy only, or bare. Three distinct ocelli present, closely contiguous in *Bibio*, in the shape of a triangle, the space on which they are placed, the "ocellar triangle," often much elevated above the level of the (contiguous) eyes (male), or frons (female). Proboscis short, blunt, with thick pubescent lamellæ; palpi variable, 4- or 5-jointed, long or short. Antennæ of eight to twelve joints; scape slightly but distinctly differentiated; flagellum of rather closely applied bead-like joints, the last one conical.

Thorax highly arched, generally closely pubescent. In *Dilophus*, armed on the dorsum with two peculiar transverse rows of strong teeth-like spines. Scutellum semicircular; metanotum fairly obvious.

Abdomen a little longer than the body, of seven or eight segments, broadly conical, sides sometimes nearly parallel. Genital organs of male consisting of a well-developed pair of two-jointed claspers, the 2nd joint rather smaller and shorter, generally more

or less incurved, both joints usually highly pubescent. Ovipositor of female withdrawn or very short, ordinarily only a pair of small lamellæ visible.

Legs relatively short and stout, compared with the usual nematocerous type (except SIMULIIDÆ and ORPHNEPHILIDÆ). Fore tibiæ sometimes ending in a strong spine (*Bibio*) or circlet of spines (*Dilophus*) or without either (SCATOPSINÆ). Three pulvilli in BIBIONINÆ, one pulvillus only in SCATOPSINÆ. Claws distinct.

Wings comparatively large and wide; costal vein not produced round the hind margin, ending before the tip of the wing. Veins on the anterior part of the wing much more distinct than on the posterior half. Auxiliary vein and 1st longitudinal vein present; 2nd longitudinal vein absent,* third vein forked (*Plecia*) or simple (*Bibio*, *Dilophus*, *Scatopse*); 4th vein forked,† 5th vein forked in *Bibioninæ*, simple in SCATOPSINÆ. The 6th and 7th veins present in *Plecia*, 6th absent in *Bibio*; only two veins posterior to the 4th in *Scatopse*, it not being quite obvious which one is absent. Schiner regarded them as the 5th and 6th, and they are termed such in the present work. The 2nd basal cell is present in the BIBIONINÆ, absent in the SCATOPSINÆ; anterior cross-vein present in *Plecia*, *Bibio*, and *Dilophus*, very short or hardly visible in some species of *Scatopse*, absent in others. Posterior cross-vein present in BIBIONINÆ, absent in SCATOPSINÆ. Anal lobe of wing prominent.

Table of Subfamilies.

A few leading characters separate the two subfamilies of BIBIONIDÆ very clearly, and they may be summarised as follows:—

Second basal cell present; the 5th longitudinal vein forked; posterior cross-vein present; three pulvilli to the tarsi; generally densely pubescent flies of moderate or comparatively large size ..	**Bibioninæ**, p. 160.
Second basal cell absent; the 5th longitudinal vein simple; posterior cross-vein absent; one pulvilliform empodium present; always small flies, much less pubescent than in the previous group	**Scatopsinæ**, p. 179.

* I am not at all sure that the 2nd longitudinal vein is not present, and the 3rd vein absent, instead of *vice versa*. If we compare a wing of *Culex* with that of *Plecia*, and simply eliminate the 3rd vein from the former and lengthen the anterior cross-vein, we get an exact counterpart in the wing of the latter. In CULICIDÆ the 5th vein is admittedly forked. *Plecia*, therefore, seems the nearest genus in the BIBIONIDÆ to the CULICIDÆ. Besides, a forked 2nd longitudinal vein is quite usual in the NEMATOCERA, but much rarer in the BRACHYCERA, whilst the 3rd vein is seldom forked in the former. The suggested interpretation is therefore more in keeping with the general rule in NEMATOCERA, but it is only tentatively put forward.

† Except in *Aspistes*, a non-Oriental genus, in which it is simple.

Subfamily BIBIONINÆ.

Nothing of importance can be added to the characters given in the above table separating the two subfamilies. The species are always larger and much more robustly built, more pubescent, and more generally distributed than the Scatopsinæ.

Table of Genera.

A. Third longitudinal vein forked. Posterior cross-vein distinctly nearer the base than the anterior cross-vein.

B. The 3rd vein forks just beyond the anterior cross-vein, the upper branch almost parallel to the lower one; the 4th vein forks exactly at the anterior cross-vein or, literally speaking, *below* it, the cross-vein connecting with the upper branch. . Pleciomyia, Brun., [p. 160.

BB. The 3rd vein forks some little distance beyond the anterior cross-vein, the upper branch sometimes approximately parallel to it, sometimes almost erect; the 4th vein forked some distance beyond the anterior cross-vein . . . . Plecia, Wied., [p. 162.

AA. Third longitudinal vein not forked. Posterior cross-vein distinctly beyond the anterior cross-vein.

C. Fore tibiæ in both sexes with a prominent tooth-like spine at the tip; dorsum of thorax never with a dentate ridge . . . . Bibio, Geoff., p. 166.

CC. Fore tibiæ in both sexes with a circlet of spines at the tip instead of the spiny process, also often with spines on the middle of the fore tibiæ; dorsum of thorax with two dentate transverse ridges . . . . Dilophus, Mg., [p. 176.

Genus PLECIOMYIA, *Brun.*

Pleciomyia, Brunetti, Rec. Ind. Mus. iv, p. 269 (1911).

Genotype, *Penthetria melanaspis*, Wied.

Allied to *Plecia*, Wied., from which it differs by the 4th longitudinal vein rather broadly forking immediately at the point of contact with the anterior cross-vein. The 3rd longitudinal vein forks almost immediately beyond the anterior cross-vein, the upper branch lying almost parallel with the lower one. The antenna has twelve joints, two short normally shaped basal ones forming the scape; a comparatively long first flagellar joint, followed by eight others of a flattened bead-shape, with a

moderately long, conical terminal joint. This is not entirely a conclusive character, as at least one other allied Oriental species (*Plecia fulvicollis*, F.) has twelve-jointed antennæ, instead of ten- or eleven-jointed as in the other allied species belonging to this region.

At present the genotype is the only known species.

117. **Pleciomyia melanaspis**, *Wied.* (Pl. XII, figs. 11, 14.)

Penthetria melanaspis, Wiedemann, Auss. Zweifl. Ins. i, p. 72 (1828).
Penthetria japonica, Wiedemann, *op. cit.* ii, p. 618 (1830).
Crapitula motschulskii, Gimmerthal, Bull. Soc. Imp. Nat. Moscou, xviii, 2, p. 330, fig. (1845).
Plecia ignicollis, Walker, List Dipt. Brit. Mus. i, p. 116 (1848).

♂ ♀. *Head* wholly black, vertex in male very prominent; frons in female one-third the width of the head, with a distinct longitudinal ridge in the middle, velvet-black, with a little dark greyish hair behind the vertex; palpi with a dark greyish tinge in some specimens. Antennæ rather larger in the female. *Thorax* black, velvet-black on about the anterior third of the dorsum, bright reddish orange on the remainder. Scutellum black. Very short black hairs cover the whole upperside of the thorax; at the sides the hair is a little longer. *Abdomen* black, with black hairs; belly similar. Genitalia large, shining black, very hairy, the 2nd joint of the claspers incurved, conical. *Legs* black, with short black pubescence. *Wings* rather deeply blackish or blackish brown, generally darker on the basal and anterior parts. Halteres black.

Length 6–10 millim.

Redescribed from a long series in my own collection and in that of the Indian Museum from a number of localities in the Himalayas. I found it common at Darjiling, 21. ix. to 2. x. 08, and also at Hankow, in China, 22–26. iv. 06, but sparingly at Mussoori, 20. v. 05. In the Indian Museum specimens have been examined from Soondrijal and Katmandu (both in Nepal), Shillong, Sibsagar, Margherita, Mungphu; Naini Tal, iv. and v. 1893; Theog, 27. iv. 07; Kurseong, 9. ix. 09; 19. vi. 10; Bhim Tal, 19–22. ix. 06; Siliguri, 18–20. vii. 07 (including a male and female *in cop.*); Darjiling, 8. iv. 10 (*C. W. Beebe*), and Sadon, Upper Burma, 5000 ft., ii. 11 (*E. Colenso*). In the Pusa collection from, amongst other localities, the Khasi Hills, iii. 07. Outside of the Indian Empire, the species occurs also in Siberia, China, and Japan.

Types in the Leyden and Vienna Museums.

Even as early as 1828 Wiedemann recognised a generic difference between this species and the species of *Plecia*, and placed it in *Penthetria*. I have not seen any other species that can be placed in this new genus.

Genus PLECIA, *Wied.*

Plecia, Wiedemann, Auss. Zweifl. Ins. i, p. 72 (1828).
Eupeitenus, Macquart, Dipt. exot. i, p. 88 (1838).
Crapitula, Gimmerthal, Bull. Soc. Imp. Nat. Moscou, xviii, 2, p. 330 (1845).
Rhinoplecia, Bellardi, Ditter. Messicana, i, p. 16 (1859).

Genotype, *Hirtea fulvicollis*, F.; by designation of Blanchard (Hist. Nat., Ins. iii, p. 576, 1840).

In general character and appearance similar to *Bibio*. The differences consist of the distinct, longitudinal, rather obtuse ridge on the frons, also in the absence of any spine or tooth-like process at the tip of the fore femora. The 3rd longitudinal vein is forked, not simple; the 4th vein is forked some distance beyond the posterior cross-vein (which is always considerably nearer the base of the wing than the anterior cross-vein) instead of at its junction with it; and there are two longitudinal veins beyond the 5th instead of only one, that is to say, both 6th and 7th longitudinal veins are present. Antennæ apparently normally 12-jointed, sometimes 10-jointed, the last joint very small and shaped like a flattened cone.*

Range. Probably world-wide, though only one species is actually recorded from Africa (*P. ruficollis*, F.). Wiedemann established this genus for four exotic species of Fabricius (placed by the latter author in his *Hirtea*), and two new ones. All the six species he included were South American except *S. fulvicollis*, the generally distributed and common Oriental one.

Table of Species.

1. The 3rd longitudinal vein forks some distance beyond the anterior cross-vein (nearly at half the length of its lower branch) and always distinctly beyond the fork of the 4th vein	2.
The 3rd longitudinal vein forks shortly beyond the anterior cross-vein (distinctly before one-third of the length of its lower branch) and approximately opposite the fork of the 4th vein; the upper branch lying almost parallel to the lower one, not almost erect as in Division 2 ..	3.
2. The whole thorax reddish yellow, including dorsum, sides, scutellum and metanotum; antennæ twelve-jointed ..	*fulvicollis*, F., p. 163.

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* The two scapal joints are short and are easily mistaken for a single joint, and as the first flagellar joint is always larger than the others, it is easily mistaken for the second scapal joint.

Only dorsum of thorax and scutellum reddish yellow, the sides and metanotum black; antennæ ten-jointed .... *tergorata*, Rond., p. 164.
3. Wholly black species.................. 4.
Dorsum of thorax reddish yellow; antennæ twelve-jointed .... *indica*, Brun., p. 165.
4. Legs wholly black; length 8–12 mm.; antennæ twelve-jointed .... *atra*, Brun., p. 165.
Legs mainly brownish; length 6–7 mm.; antennæ ten-jointed .... *obscura*, Brun., p. 166.

118. **Plecia fulvicollis**, *F.* (Pl. XII, figs. 12, 15.)

Hirtea fulvicollis, Fabricius, Syst. Antl. p. 53 (1805).
Plecia fulvicollis, Wiedemann, Auss. Zweifl. Ins. i, p. 73 (1828).
Penthetria thoracica, Guérin, Belanger's Voy. aux Indes-Or., Zool., p. 507, pl. iv, f. 9 (1833).
Plecia dorsalis, Walker, Proc. Linn. Soc. i, p. 5 (1857).
Plecia subvarians, Walker, *op. cit.* i, p. 105 (1857).

♂ ♀. *Head*: in the male the vertex is more or less conspicuous; in the female the frons is dull black, barely one-third the width of the head, with a longitudinal ridge in the middle from the vertex, ending below in a small protuberance immediately above the antennæ. In both sexes the twelve-jointed antennæ vary from reddish brown to black, sometimes the scape being reddish, with the flagellum black, or *vice versâ*; in some specimens wholly reddish or brownish yellow. Proboscis and palpi black, with short black pubescence. *Thorax* wholly orange, varying a little in tint; the whole of the sides, scutellum, and metanotum of the same colour. In many specimens traces of the three dorsal stripes of the pattern common in the NEMATOCERA can be seen, barely darker than the ground-colour; in some specimens they are more obvious. *Abdomen* black, with short blackish hair. Genital organs normal. *Legs* mainly black; coxæ and trochanters yellowish or brownish yellow, tibiæ sometimes dark brown, pulvilli yellowish white. *Wings* pale brown, only a little darker on the anterior part, sometimes the whole wing pale blackish. Veins distinct; stigma absent. Halteres yellowish, clubs blackish.

Length normally 5½–7 millim. One individual examined measured only 4 millim.

Redescribed from a considerable number of both sexes in my own collection and in that of the Indian Museum from numerous localities in India, Ceylon, Assam, the Malay Peninsula, Java, and elsewhere. The Indian Museum has it from Haddo, Ross Island (Andamans), 3. iv. 11, at light (*Paiva*); base of Naini Tal Hills, 4. iv. 10; Purneah, Bengal, 13. x. 07 (*Paiva*); Kasauli, 16. v. 08, Travancore, 19–27. xi. 08 (both *Annandale*); Jabalpur, iv. 05, Meerut, 25. iv. 05 (both *Brunetti*); also Bangalore; Kawkaraik, Tenasserim, 1. iii. 08 (*Annandale*); Peradeniya, Ceylon, 21–28. v. 10 and 9. viii. 10, ♂ ♀ *in cop.* (*Gravely*). It is also

present from Semarang, ii. 05 and i. 06, and Batavia, viii. x. 07, both in Java. In the Pusa collection, from Pusa, 2. iv. 06 and iii. 07, and Chapra, Bengal; Kandy, Ceylon, x. 00. Outside of our limits the species occurs also in Java, Borneo, Sumatra, Papua, other East Indian islands, and the Philippines. It is probably found throughout the whole of the Orient.

Type. The location of the individual type, if indeed any one specimen was set up as such, is uncertain. The species is represented in the older collections, such as those of Fabricius, Wiedemann, and Westermann.

Through the kindness of Mr. E. E. Austen, who has examined the type male and female of *subvarians*, Walk., in the British Museum, I am able definitely to allot this name synonymic rank. From notes on *P. thoracica*, Guér., supplied by the same gentleman, I have no hesitation, knowing the variability of *P. fulvicollis*, in regarding Guérin's species as also identical; and further, I am enabled to correct the reference to *P. thoracica* as given by Van der Wulp.

119. **Plecia tergorata**, *Rond.* (Pl. XII, fig. 17.)

Plecia tergorata, Rondani, Ann. Mus. Civ. Genova, viii, p. 462 (1875); Osten Sacken, *op. cit.* xvi, p. 397 (1881).

♂ ♀. *Head* black; vertical triangle distinct and elevated. Antennæ ten-jointed; scapal joints almost cylindrical, narrower at the base, the first rather shorter; 1st flagellar joint longer than the others, subcylindrical, narrower at the base, the following six joints flattened bead-shaped, apical joint very minute, flattened conical. Frons in female over a third the width of the head; the longitudinal ridge not so distinct as in *P. fulvicollis*. *Thorax*: the dorsum only, reddish orange, the anterior portion in many examples, irrespective of sex, more or less blackish brown; except the dorsum and the concolorous scutellum, all the remainder of the thorax is black, including the metanotum; the three dorsal stripes are occasionally quite obvious, the median one often reduced to two thin lines; normally they appear to be very faint or wholly absent; when present they reach often from the anterior border to the middle, but never extend to the posterior half. *Abdomen* black, with a little black pubescence. Genitalia more slender than in *P. fulvicollis*. *Legs* all black, normally pubescent, comparatively long. *Wings* dark grey, the anterior border barely darker; veins distinct; stigma distinct, oval, dirty brown. Halteres fuscous.

Length 3½–5 millim.

Redescribed from several of each sex in the Indian Museum collection from the Himalayas; Bhim Tal, 19–27. ix. 06, Sukna, 1. vii. 08 (both *Annandale*); Kurseong, Darjiling, 6–9. viii. 09 (*Paiva*); Shan Hills, Upper Burma, 26. vi. 10 (*Annandale* and

J. C. Brown); also a pair taken *in cop.* at Bhim Tal. 27. ix. 07. In the Pusa collection, from the Khasi Hills, 17. iii. 07, Mussoori, x. 06, Malabar, 5. viii. 07. I have seen it from Bhowali, 13. vi. 10, taken by Mr. Imms on herbage. The species also occurs in Borneo and Java.

Type. Presumably in the Genoa Museum.

In spite of Rondani's remark that the wing is wholly black, without a trace of yellow at the base, three or four of the above-mentioned specimens have the wings wholly yellowish brown; yet there can be no doubt of their identity with this species. In both *Pleciomyia melanaspis* and *Plecia fulvicollis* the wings are sometimes more brown than black. The scapal joints and 1st flagellar joint of the antennæ are relatively longer than in either of these species.

120. Plecia indica, *Brun.*

Plecia indica, Brunetti, Rec. Ind. Mus. iv, p. 271 (1911).

♂ ♀. Entire body black, with the exception of the dorsum and the upper part of the thorax, above the ridge line about the insertion of the wings; this part is wholly bright ferruginous red, and very minutely pubescent.

Antennæ as in *atra*, but the 1st flagellar joint hardly longer than those immediately following. *Wings* blackish, darker on anterior border; stigma and halteres black.

Length 6–9 millim.

Described from two males and several females in the Indian Museum from Darjiling, 2. x. 08 (*Brunetti*); Theog, Simla Hills, 27. iv. 07, and Kumaon, ix. 06 (both *Annandale*); Soondrijal (Nepal), Kangra Valley, 4500 ft., and Kimoli, 24. x. 07; Ukhrul, Manipur, 6400 ft. (*Rev. W. Pettigrew*). I also took it at Darjiling, 10–16. x. 05. In the Pusa collection from Mussoori, x. 06, and Khasi Hills, 17. iii. 07.

Type in the Indian Museum; cotypes in the Pusa and my own collection.

121. Plecia atra, *Brun.* (Pl. XII, fig. 13, 16.)

Plecia atra, Brunetti, Rec. Ind. Mus. iv, p. 272 (1911).

♀. Entire body deep velvet-black, especially on the dorsum of the thorax.

Antennæ of twelve joints, the scapal two short and subcylindrical, the 2nd being wider at the tip; the 1st flagellar joint is cup-shaped at its base; the following eight joints of equal size, of flattened bead-shape, the twelfth one small, conical; the whole antenna straight and slightly pubescent. *Abdomen* rough, minutely pubescent. *Wings* blackish, anterior part much darker, stigma black; halteres greyish black. The 4th longitudinal vein not forked until some distance from the anterior cross-vein; upper branch of the 3rd

longitudinal vein long, almost parallel to the lower one, originating close to the anterior cross-vein. *Legs* bare, pulvilli greyish white.
Length 8–12 millim.

Described from four females in the Indian Museum (including *type*) from Bhim Tal, 4500 ft., Kumaon, 19–22. ix. 06 (*Annandale*), and from Soondrijal, Nepal.

This is the only wholly black Eastern species except my *P. obscura*, which is more dirty black in colour, with a tendency to brown in the legs, besides being smaller in size.

122. **Plecia obscura,** *Brun.*

Plecia obscura, Brunetti, Rec. Ind. Mus. iv, p. 272 (1911).

♂ ♀. Wholly dirty black, minutely pubescent.

Head: vertex in male wholly occupied by the very large cup-shaped ocelli, which are placed, so to speak, on their sides with their bases united. *Antennæ* rather stout, black, scapal joints equal in length, short; 1st flagellar joint longer than each scapal joint, slightly pinched in the middle; remaining seven joints subequal, normal (no obvious minute apical joint in one example, antennæ incomplete in the other two). *Thorax*: on dorsum and sides sometimes brownish (in one specimen). *Abdomen*: genitalia of male forming a pair of strong hairy claspers, two-jointed, the basal joint the longer and stronger, the 2nd joint ending apparently in a single claw. In the female the genital organ is narrow, cylindrical, short, ending in a pair of rather slender palp-like appendages. *Legs*: femora dark mahogany-brown, remainder of legs blackish brown. *Wings* blackish brown, darker on anterior part; venation as in *P. indica.*
Length 6–7 millim.

Described from two males and one female in my collection, captured by me at Mussoori, 24. v. 05. Not in very good condition, but the specific characters quite distinct enough to recognise as representing a good species.
Types in my collection.

Genus **BIBIO,** *Geoff.*

Bibio, Geoffroy, Hist. d. Ins. ii, p. 571 (1764).
Pullata, Harris, Expos. Brit. Ins. p. 77 (1776).
Hirtea, Meigen, Illig. Mag. ii, p. 264 (1803).

Genotype, *Tipula hortulana,* L.; by designation of Latreille (1810).

Head oval, flattened, much larger in the male than in the female. Eyes in male contiguous or subcontiguous, the upper facets much larger than the lower ones, and by their extent nearly overshadowing the latter altogether, usually densely pubescent, the outline of the eyes being semicircular or bluntly conical; in the

female the eyes are oval, much smaller, bare, separated by a very broad flat frons, often nearly of half the width of the head; three ocelli on a small triangular distinct protuberance. Proboscis moderately prominent, with thickened hairy labella; palpi varying in length, generally five-, but in some species four-jointed, the 1st joint small, the 3rd often thickened. *Antennæ* rather short and comparatively stout, cylindrical, generally of ten joints, but in some cases only nine; the joints set rather closely together, the

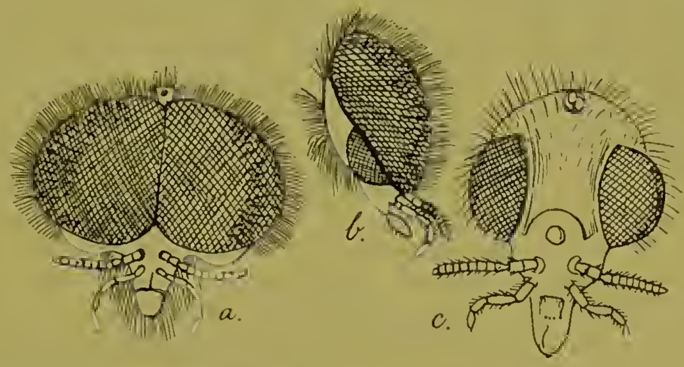

Fig. 17.—Head of *Bibio*: *a*, front view of ♂; *b*, side view of ♂; *c*, front view of ♀.*

last one rounded; the whole antenna not much longer than the head. *Thorax* much elevated, generally closely pubescent; scutellum small, semicircular. *Abdomen* elongate, conical; of seven or eight segments. Genitalia consisting in male of a pair of two-jointed claspers, the 2nd joint incurved, conical; both generally densely pubescent. In the female the short ovipositor terminates in two small lamellæ. *Legs* moderately long, robust, hardly longer than in the brachycerous families; the hinder pair generally longer than the others; fore femora usually thickened; fore tibiæ prolonged into a stout, slightly curved spine, a smaller adjacent spine not infrequently being present. Hind femora and tibiæ often incrassated distally, the latter with two small spurs at the tip; hind metatarsus shorter than the remaining four joints taken together. Pulvilli, empodia, and claws well developed. *Wings* of considerable size, broad, with the costal vein ending before reaching the tip. Auxiliary and 1st longitudinal veins present, the 2nd absent, the 3rd present, simple,† all these ending in the costa between the middle and the tip of the wing.

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* In the figure eleven joints are incorrectly shown; there should be, at most, ten only.

† As stated in the introduction to this family, it seems to me that the vein referred to may be the 2nd longitudinal and not the 3rd. I follow custom, however, in terming it the 3rd. Its place of origin, length, and forked character in allied genera (*Plecia*, *Aspistes*) all resemble the usual nature of the 2nd longitudinal rather than the 3rd.

Anterior cross-vein about the centre of the wing, of moderate length; 4th longitudinal vein always forked, at a little beyond the anterior cross-vein and at its junction with the posterior cross-vein; the 5th vein forked, the 6th nearly straight, not reaching the wing-margin, the 7th absent; posterior cross-vein always distinctly beyond the anterior cross-vein. Alulæ well developed; tegulæ rudimentary.

Range. World-wide.

Life-history. The larva of *Bibio* lives in various substances, in the earth, in decaying animal and vegetable matter, in the roots of grass and corn, the stems of plants, and similar situations. It is dirty white or brownish in colour, cylindrical, with a brownish head which has three pairs of large bristly hairs and some smaller ones. The body is twelve-segmented, the first narrow, with two rows of fleshy tubercles, the remainder large, each with a single row of six tubercles; the 12th segment a little smaller, with two black dots on its dorsal surface. There are some tubercles around the base of the anal segment, and there are also two lateral tubercles on each segment and two rows of four in each on the ventral surface. The larva possesses twenty spiracles.

Pupation, so far as European species go, takes place in June, the pupa being dark brown, with a shrivelled appearance, one-third of an inch long and very broad; the anal segment very small, with two divergent spines on the dorsal surface; the wing-cases small, closely surrounding the legs, the thoracic part much elevated.

The life-histories of several European species have been described, that of *Bibio marci*, L., by Heeger (Sitzb. k. Acad. Wiss. ix, p. 263). *B. hortulanus*, L., is known to breed in garden-earth, and *B. johannis*, L., in cow-dung.

Bibio is essentially a spring genus, some species appearing, however, in the autumn. The males love the sunshine, and perform aërial dances beneath the boughs of trees; the females are more often found in woods or more shaded spots. The sexes are frequently taken *in copula*, and often differ very considerably in coloration. I have myself taken *B. marci* and *B. hortulanus* in that way in England, and several paired couples of *B. obscuripennis* at Darjiling.

Table of Species.

1. Thorax partly or wholly reddish yellow or brownish yellow (at least the dorsum wholly red in all the species except *discalis*, in which it is black)	2.
Thorax wholly black	3. [p. 169.
2. Dorsum of thorax yellowish	*hortulanoides*, Brun., ♀,
Dorsum of thorax black	*discalis*, Brun., p. 174.
3. Abdomen wholly reddish yellow	*abdominalis*, Brun.,
Abdomen wholly black	4. [p. 172.

4. Larger species, at least 10 mm. Basal part of 3rd vein usually much longer than the anterior cross-vein	5.	
Smaller species, at most 7 mm. Basal part of 3rd vein usually barely (if at all) longer than the anterior cross-vein	6.	[p. 169.
5. Species 14 mm. long	*hortulanoides*, Brun., ♂,	
Species 10–12 mm. long	*obscuripennis*, Meij.,	
6. Femora wholly bright reddish or yellowish.	7.	[p. 170.
Femora wholly black or dark brown......	8.	
7. Femora yellowish, tibiæ yellow	*johannis*, L., p. 174.	
Femora reddish, tibiæ and tarsi black	*rufifemur*, Brun., p. 175.	
8. Hind tibiæ reddish yellow; veins on posterior part of wing distinct to hind margin, but paler than those in the anterior half.	*fuscitibia*, Brun., p. 175.	
Hind tibiæ dark brown or black; veins uniformly distinct, or those on posterior half of wing paler, and either distinctly carried to the hind margin or abbreviated.	9.	
9. Veins on posterior half of wing, viewed in certain directions, as distinct as those in anterior half; hind tibiæ black	*approximatus*, Brun.,	[p. 173.
Veins on posterior half of wing less distinct than those on anterior half	10.	
10. Hind tibiæ dark brown; lower branch of 4th vein and upper branch of 5th not reaching border of wing	*defectus*, Brun., p. 176.	
Hind tibiæ black; all veins reaching wing-margin	*proximus*, Brun., p. 171.	

The above table is constructed for convenience' sake, and does not illustrate the affinities of the species. The order in which the descriptions are arranged is intended to represent their affinities. Schiner and others have adopted the relative lengths of the basal portion of the 3rd longitudinal vein and the anterior cross-vein as the preliminary distinction in separating the species, but in view of its decided variability in *B. obscuripennis* and the closely-allied European species *B. marci*, L., it seems safer to distinguish the species comprised in the present work by their conspicuous differences in colour.

123. Bibio hortulanoides, *Brun.*

Bibio hortulanoides, Brunetti, Rec. Ind. Mus. iv, p. 274 (1911).

♂ ♀. *Head*: in the male the eyes are closely contiguous from the vertex to immediately above the antennæ, leaving a very small frontal triangle; the eyes with dense dark brown hair. Proboscis, palpi, and antennæ black, with thick long dark brown hairs, which are also long and thick behind the vertex. Vertical triangle conspicuously elevated, bearing the three ocelli. In the female the frons is one-third the width of the head, shining black, with some short black hairs; ocellar tubercle as in male. The other parts as in the male, but the hair is more blackish than brown, whilst the

pubescence on the proboscis, palpi, underside of head, and behind the eyes is yellowish. *Thorax*: in male, dorsum, scutellum, and sides shining black, densely covered with blackish brown hair. In the female the dorsum is bright brownish yellow (with microscopic concolorous pubescence), the colour very sharply delimited; the remainder of the thorax black, moderately shining, with short black hairs. Scutellum and scutellar ridge black; metanotum black. *Abdomen*: in male, shining black, wholly covered on all sides with thick blackish brown hair; the genital organs shining black, obtuse, bilobed. In the female, bright brownish yellow with short concolorous pubescence; belly similar; genital organs inconspicuous. *Legs* shining black, pubescent, spines on fore tibiæ with a dull carmine tinge, pulvilli yellowish white. *Wings* brownish in male, as in *B. obscuripennis*, Meij.; in female very pale grey, conspicuously lighter than in the male, anterior border a little blackish in the male, but wholly deep black in the female. Stigma large, black. Halteres black.

Length, ♂ 14, ♀ 11–12 millim.

Described from a male and female in bad condition in the Indian Museum (labelled simply "Ind."), which were returned by Bigot marked "*hortulanus* ♂ ♀ ?"; also a perfect female obviously of the same species taken at Kurseong, 15. v. 10.

Types in the Indian Museum.

This is either a large and well-marked variety of *B. hortulanus*, L., or distinct. The differences apparent are, the much greater size of the male, *hortulanus* being generally about 8 to 11 mm. in length; the brown, not whitish, wings in the male; the black hair in the female on the underside of the head and behind the eyes, the hair in this position in *hortulanus* (♀) being yellowish.

124. **Bibio obscuripennis**, *Meij.*

Bibio obscuripennis, Meijere, Bijd. tot de Dierk. xvii, p. 86 (1904).

♂ ♀. *Head*: in male, wholly covered, including the eyes, with dense brown hairs; vertex prominent, shining; antennæ

Fig. 18.—*Bibio obscuripennis*, Meij., wing.

seen from behind appearing grey-tipped at the joints. In female the frons much more than one-third the width of the head; hairs black. *Thorax* wholly shining black, the extreme anterior corners of the dorsum very narrowly reddish brown; dorsum and prothorax with dense very dark brown hair,

Sides and scutellum similar; metanotum sometimes very dark brown, normally black. *Abdomen* black, with dark blackish brown hair. Male genitalia black, shining, pubescent; tips of claspers with several reddish yellow curved horny claws. The female abdomen has a little inconspicuous dark grey hair here and there at the sides. *Legs* wholly shining black, with dark brown hair, which is shorter and blacker on the tarsi, of which the bases and tips of the joints are often very narrowly reddish brown; spines of fore tibiæ tipped with dull carmine. *Wings* brownish grey, anterior part much darker, costal cell nearly black, stigma elongate-oval, black. The wing in the female barely darker than in the male. Halteres black, tegulæ with blackish grey hair.

Length, ♂ 11–12, ♀ 12–15 millim.

Redescribed from a long series of males and several females taken by me at Darjiling, 16. x. 05; also from specimens of both sexes in the Indian Museum from the following localities:— Kurseong, 27–28. iv. 10 (*D'Abreu*); Matiana, Simla district, 28–30. iv. 07 (*Annandale*); Naini Tal, 26. ix. 07; Chitlong, Nepal, and a male from Mt. Tahe-pum, 4000–5000 ft., on the N.E. Burmese Frontier, xi. 10 (*C. W. Beebe*).

Type ♂ and ♀ in the Amsterdam Museum.

The species was abundant at Darjiling during a few days round the 16th October 1905, when I captured several pairs *in copula*. My identification of the species has been confirmed by de Meijere's examination of some of the specimens. Its chief distinction from *B. marci*, L., to which it bears a remarkably close resemblance, is the brown wings in the male, as in *B. marci* they are nearly clear, with a whitish tinge. The basal section of the 3rd vein in both species varies distinctly in its relative length to that of the anterior cross-vein, in some specimens being one-and-a-quarter times as long, in others as much as nearly double, and it cannot be relied on as a specific character.

125. **Bibio proximus**, *Brun.*

Bibio proximus, Brunetti, Rec. Ind. Mus. iv, p. 275 (1911).

♂. *Head* wholly black, clothed with black hairs, including dense pubescence on the eyes. *Thorax* wholly black, dull, dorsum rather more shining anteriorly, pubescence black. *Abdomen* black, with black pubescence. *Legs* black; hind femora barely incrassated posteriorly, distinctly less so than in *B. marci*; hind tibiæ more incrassated towards tips than in that species, giving a distinctly clubbed appearance; hind metatarsus distinctly incrassated, the second joint of the tarsi two-thirds as long as the metatarsus. (In *B. marci*, the metatarsus is not at all incrassated, and is twice the length of the next joint.) Spines on fore tibiæ tipped with carmine. *Wings* very pale grey, only the anterior veins dark, those on hind part of wing normally pale; first section of 3rd vein barely as long as anterior cross-vein

(in *B. marci* it is always distinctly longer, often twice as long). Halteres black.

Length 5 millim.

Described from a single male from Darjiling taken in November, 1910, by Mr. D'Abreu.

Type in the Indian Museum.

This species is intermediate between *B. marci*, L., and *B. obscuripennis*, Meij. From the former it is distinguished by the black, not dark brown pubescence; the shortness of the basal part of the 3rd longitudinal vein, and the incrassation of the hind metatarsus. Minor differences are the lesser incrassation of the hind femora, the greater incrassation of the hind tibiæ and the pale grey wings, as contrasted with the quite whitish wings of *B. marci*. When placed by the side of a specimen of *marci*, these differences appear sufficiently distinctive.

From *B. obscuripennis*, Meij., it differs by its smaller size and clearer wings and in the structure of the hind metatarsus, which in de Meijere's species is not distinctly incrassated and is twice the length of the following joint.

126. Bibio abdominalis, *Brun.*

Bibio abdominalis, Brunetti, Rec. Ind. Mus. iv, p. 276 (1911).

♂ ♀. *Head* wholly black; vertex very small, shining black, with small distinct ocellar triangle. Eyes (which are densely pubescent in the male with very dark brown or nearly black hair), contiguous from vertex to antennæ, the frontal triangle very small. Antennæ and palpi wholly black, moderately pubescent. *Thorax* shining black, closely pubescent; a fan-like bunch of hairs in front of, and another one below, the root of the wing. Scutellum and metanotum shining black, the former with long soft black hairs on the posterior margin, with a tendency to curl forwards; metanotum bare. *Abdomen* shining black in male, with close long black pubescence; belly similar; genital organs confined in a hard squarish segment-like case. In the female the abdomen is normally wholly reddish yellow, with minute sparse black pubescence; belly similar; genital organs apparently comprised in a flat elevation on the underside of the last abdominal segment.* *Legs* shining black, anterior femora with dense black hair, hind pair with the hair much sparser; tibiæ and tarsi moderately pubescent. *Wings* dark grey in male, a little blackish in female, in both sexes somewhat iridescent in certain lights; costal cell and stigma brownish; veins dark brown. The basal section of the 3rd longitudinal vein is almost exactly equal

* In the type male and female, which still remain united, both abdomens are considerably stretched out, as though the insects in life had endeavoured to separate themselves, yet no extension of any part of the male genitalia can be seen. There is a small thick rounded organ between the two abdomen tips of the same red colour as the female abdomen, but it is not obvious to which abdomen it really belongs.

to the anterior cross-vein; the 4th longitudinal vein forks immediately before the posterior cross-vein. Halteres blackish.

Length 7–8 millim.

Described from a male and female taken *in cop.* by Mr. A. D. Imms at Badrinath, 10,200 ft., Garhwal district, 27. v. 10 (*types*), also from one additional male and three additional females of the same date and locality, and a female taken by Dr. Annandale at Phagu, Simla district, 9,000 ft., 11. v. 09.

Types in the Indian Museum (also most of the other specimens).

One of the three females referred to above has the abdomen blackish except towards the side, where the colour is sufficiently distinct to indicate that the specimen belongs to this species.

Very like *B. marci*, L., the common Palæarctic and North American species, but in that insect the female abdomen is wholly black, as in the male, so that in spite of the resemblance between the males, the specific difference between the two forms is indisputable.

127. Bibio approximatus, *Brun.*

Bibio approximatus, Brunetti, Rec. Ind. Mus. iv, p. 277 (1911).

♀. *Body* wholly black, *Head* much flattened, slightly pubescent. *Thorax*: dorsum with sparse short black hairs; a very small brownish yellow spot just below posterior corners of dorsum. Scutellum and metanotum black. *Abdomen* with very pale yellowish hairs. Ovipositor normal. *Legs*, with terminal spines on fore tibiæ, reddish brown, apical spurs on posterior tibiæ brownish yellow; hind metatarsi not at all thickened, nearly twice as long as the 2nd tarsal joint. *Wings* pale yellowish grey, hardly darker on anterior part; veins pale brownish yellow, but clearly defined; those on hinder part of wing, when viewed from certain directions, appear almost as dark as the anterior veins. Stigma large, well defined, oval, black; a slight narrow blackish suffusion over base of 5th longitudinal vein; basal portion of 3rd longitudinal vein almost exactly equal to the length of the anterior cross-vein. Halteres black, but basal half of stem yellowish.

Length 5–6 millim.

Described from one female from Kurseong, November, 1910, taken by Mr. D'Abreu.

Type in the Indian Museum.

This species must bear a considerable resemblance at first sight to *Bibio venosus*, Mg., owing to the rather clear wings, the distinctness of the veins, and the similarity in size. Though the abdomen is given as only a little over 5 millim. in length, it is probably more in living specimens, as the single example examined appears to be shortened by shrinkage; otherwise the wings are abnormally long, their full expanse being 20 millim. The relative length of the hind metatarsus to the following joint is practically

identical in both species, and it is quite possible the specimen before me really is a variety of *B. venosus*, Mg., bearing about the same relation to it as *B. obscuripennis* does to *B. marci*; the only suggested differences in my species from *B. venosus* being the grey instead of clear wings, and the pale yellow instead of whitish colour of the abdominal pubescence.

128. **Bibio discalis**, *Brun.*

Bibio discalis, Brunetti, Rec. Ind. Mus. iv, p. 278 (1911).

♀. *Head*: frons over a third the width of the head, dull black, with sparse short black hair. Ocellar triangle normal. Pale hairs behind the vertex. Antennæ black, scape yellowish. Tip of proboscis yellowish and the 1st joint of the palpi also, the remainder black; all the organs with black pubescence. *Thorax*: dorsum dull black, sharply delimited from the wholly yellowish remainder of the thorax. Prothorax considerably enlarged, conspicuously over the anterior corners of the dorsum. Scutellum yellowish, metanotum black. The whole thorax and the scutellum with pale yellow hairs. *Abdomen* black; pale yellow hairs on both dorsal and ventral surfaces, extreme tip and belly yellowish. *Legs* yellowish, knees narrowly black; fore tibiæ and tarsi (in one example) with a slight pale reddish brown tinge and the spurs tipped with carmine, tips of tarsi brown. *Wings* pale grey, anterior border no darker, stigma light brown, elongate. Halteres yellowish.

Described from two females from Phagu, Simla district, 9000 ft., 11. v. 09, taken by Dr. Annandale.

Type in the Indian Museum.

This species has considerable resemblance to *B. johannis* ♀, but the distinctly yellowish thorax, with well-defined black dorsum, at once distinguish it from the European species, in which the whole thorax is black or blackish brown.

129. **Bibio johannis**, *L.*

Tipula johannis, Linnæus, Syst. Nat. ed. xii, II, p. 976 (1767).
Hirtea johannis, auctt.
Tipula pyri, Fabricius, Ent. Syst. iv, p. 249 (1794).
Hirtea pyri, auctt.
Tipula pomonæ, Schrank, Fauna Boica, iii, p. 79 (1803).
Hirtea hyalinus, Meigen, Klass. i, p. 110 (1804).
Hirtea præcox, Meigen, *op. cit.* p. 111.
Hirtea rufipes, Meigen, Syst. Besch. vii, p. 55 (1838).

♂ ♀. *Head*, in male, with thick dark brown hair, including the eyes. Antennæ dark brown or blackish; proboscis and palpi black. Some hairs behind the vertex yellowish brown. *Thorax* shining black, with blackish brown hair, the upper corners of the prothorax brownish yellow. Scutellum and sides black. *Abdomen* black, with dark brown hairs; belly similar. Genitalia of male

obtusely conical, protected by a hood-shaped dorsal plate; of female, inconspicuous. *Legs* wholly brownish yellow, with a little short black pubescence, coxæ blackish, tarsi a little darker at the tips; fore tibial spine prominent. Hind femora club-shaped, hind tibiæ robust, gradually thickening from base to tip; the spurs remarkably small. *Wings* pale yellowish grey, the anterior border no darker; anterior veins blackish, the remainder pale yellowish; stigma distinct, elongate-oval, dark brown. Halteres black.

Redescribed from two males taken by Dr. Annandale at Matiana, 8000 ft., 28–30. iv. 07, and another from Theog, 9000 ft., 2. v. 07, both in the Simla district; also from European specimens.

In Europe this species is common and generally distributed.

Type. The location of this is extremely doubtful.

The identity of the specimens examined with this common European species cannot be doubted, as they agree exactly both with the descriptions and with European specimens examined at the same time. Probably other Palæarctic species will be found to occur along the Himalayas, as the genus is a hardy one, with a considerable geographical range.

130. Bibio rufifemur, *Brun.*

Bibio rufifemur, Brunetti, Rec. Ind. Mus. iv, p. 279 (1911).

♀. *Head* black; antennæ with a little blackish pubescence; some short grey hairs behind head. Ocelli close together on a small triangle on extreme vertex; frons wholly bare. *Thorax* black with a little brownish grey hair on the pleuræ; scutellum and metanotum shining black, the former with a few short black hairs on the hind margin. *Abdomen* black, roughened, with black and brown hairs. *Legs*: coxæ shining black, with microscopic yellow pubescence, and a few longer hairs; tips reddish on the outside; femora bright orange-red, with sparse, very short, yellow hairs, tips black; remainder of legs black, with short black or brown hairs, tips of tarsal joints narrowly yellowish brown. *Wings* brownish grey, darker anteriorly; costal cell rather dark brown; stigma distinctly dark brown, rather small, elongated egg-shaped, not touching 3rd longitudinal vein; veins on front half of wing brown, 4th, 5th, and 6th veins brownish yellow; 4th vein forks rather widely at junction with posterior cross-veins and just beyond tip of 2nd vein. Halteres black.

Length 6–7 millim.

Described from two females in my collection, taken by me at Darjiling, 20. x. 05.

131. Bibio fuscitibia, *Brun.*

Bibio fuscitibia, Brunetti, Rec. Ind. Mus. iv, p. 279 (1911).

♂. *Head* black, with rather long and thick black hairs, mixed with some dark brown ones; antennæ and palpi black, mouth greyish white. *Thorax* and scutellum shining black, with black

hair. *Abdomen* black, moderately shining, with blackish and dark brown hairs; belly similar. *Legs* normal; femora black, with brown hairs; fore tibiæ dark brown, ending in a light brown spine, posterior tibiæ reddish brown, middle pair darker, black at tips, shortly setose; hind pair with softer hairs, darker towards tips; tarsi brown, darker at tips; hind metatarsus thickened, one-and-a-half-times as long as next joint. *Wings* nearly clear, stigma dark brown, moderately long, and distinct; 4th longitudinal vein forking exactly at junction with outer cross-vein, the branches not widely separated. Halteres black.

Length 5–6 millim.

Described from a male in the Indian Museum from Phakia, Kumaon, 10,700 ft., 3. vi. 09 (*A. D. Imms*), and a second male in the same collection from Tonglu, Darjiling, 10,000 ft., 21. iv. 10 (*C. W. Beebe*).

This species bears a considerable resemblance to the European *B. laniger*, Mg., but the latter has greyish brown, thicker, woolly hair, and a comparison of specimens of the two species shows them to be quite distinct.

132. **Bibio defectus**, *Brun.*

Bibio defectus, Brunetti, Rec. Ind. Mus. iv, p. 280 (1911).

♂. *Head* and appendages wholly black, with very short pubescence. *Thorax* shining black, with dark brown hairs; scutellum and sides black. *Abdomen* black, with brown hairs, and greyish hairs at the tip and at the sides near the base. *Legs* dark brown; hind femora nearly black, somewhat long, distinctly though not greatly clubbed, hind tibiæ a little lighter, with darker streaks, also clubbed. *Wings* pale brownish grey; stigma moderately large and distinct; 4th longitudinal vein forking distinctly before the posterior cross-vein, the branches moderately diverging; lower branch of 4th and upper branch of 5th veins shortened, not reaching the wing-margin. Halteres black.

Length 3½ millim.

Described from a unique male from Kurseong, Darjiling, 13. viii. 09 (*Paiva*); preserved in the Indian Museum.

This species comes into the group containing the European species *B. clavipes*, *B. varipes*, etc.

Genus **DILOPHUS**, *Mg.*

Dilophus, Meigen, Illig. Mag. ii, p. 264 (1803).
Acanthocnemis, Blanchard, Gay's Hist. fis. polit. Chile, Zool. vii, p. 355 (1852).

Genotype, *Tipula febrilis*, L.; designated by Latreille (1810).

Head semicircular in male, broader in female. Eyes of male contiguous, large, rounded, pubescent; those of female small, oval, divided by the very broad flat frons, bare; three ocelli. Proboscis rather prominent; palpi long, 5-jointed, the 3rd joint

thickened, the 4th and 5th narrow, subequal. Antennæ short and rather thick, ten- or eleven-jointed; scapal ones slightly differentiated, the others transverse, flattened bead-shape, the last one flatly conical; the terminal joints so closely applied to one another as to be difficult to distinguish. *Thorax* very arched, produced and emarginate on anterior margin of dorsum in the form of a conspicuous transverse ridge, with a row of short tooth-like points; a second similar ridge before the middle of the dorsum. Scutellum semicircular, broad, short. *Abdomen* of seven or eight segments, elongated. Genitalia of male rather large and prominent, the tip of the abdomen generally curved upwards. *Legs* robust; femora, especially fore pair, thickened; fore tibiæ with a circlet of spines at the tip, in addition to a few spines around its middle; middle and hind tibiæ with short apical bristles; metatarsus of hind legs shorter than the remaining tarsal joints taken together; claws and pulvilli large, empodia distinct. *Wings* of moderate size, or comparatively large. Auxiliary and 1st longitudinal veins as in *Bibio*; 3rd sharply angled near the base, thence running to the costa some distance in front of the tip of the wing. Anterior cross-vein placed at the angle; 4th vein forked. Posterior cross-vein at fork of 4th, always distinctly beyond the anterior cross-vein; 5th vein forked, 6th vein shortened, 7th absent. Alulæ prominent.

Range. Dilophus occurs throughout the world, though the species are less numerous than in *Bibio*.

One very common European species, *D. febrilis*, L. (*vulgaris*, Mg.), (so called from a supposed connection between this fly and the occurrence of fever, a supposition which probably has no foundation), appears occasionally in immense swarms, and possibly other species may be found in the East with a similar habit. Such a swarm occurred in England in 1862.

Life-history. The larva of *D. febrilis* is apodal, cylindrical, covered with stiff bristles, the head chestnut-brown. The larva lives in various substances. Curtis says it is found in cow- and horse-manure, and Theobald has reared the species from the latter. Miss Ormerod records it as feeding on hop-stems and the roots of grasses, corn and various plants. The pupa is whitish or pale brown. The perfect insect emerges in May, and there is a second brood in the autumn. It is generally distributed, but seems partial to greenhouses and conservatories, especially those containing vines.*

The synonym *Philia*, Mg., erected in 1800 without any species, cannot take the place of *Dilophus*, which, although it was proposed in 1803 without an attendant species, was justified a year later by the allotment of three species in Meigen's "Klassification, etc."

* The above species is referred to at some length, although not Oriental, on account of the distinct economic importance of the genus, and because the life-history is not known of any indigenous species. The habits of Indian species are likely to be similar.

133. **Dilophus gratiosus**, *Big.*

Dilophus gratiosus, Bigot, Journ. Asiat. Soc. Bengal, lix, p. 265 (1890).

♂. *Head*: eyes rather bright reddish brown, some long whitish hairs below the head. *Thorax* shining, abdomen somewhat roughened; posterior margin of scutellum, and a scutellar ridge below it, connecting it with the metanotum, bright brownish yellow. The whole body with short sparse pale hairs. *Legs*

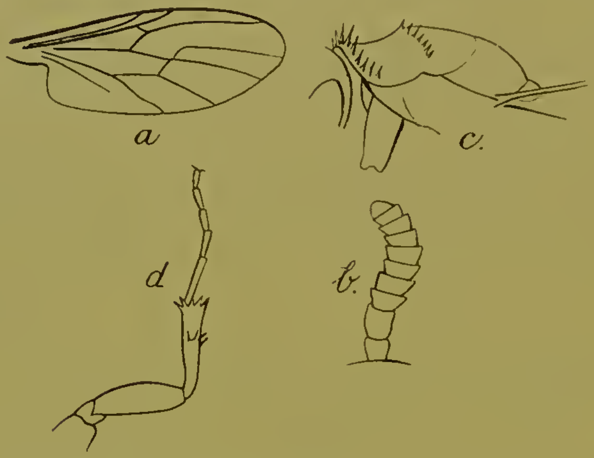

Fig. 19.—*Dilophus gratiosus*, Big.: *a*, wing; *b*, antenna; *c*, thorax; *d*, fore leg.

reddish brown, with yellowish hairs (longest on the femora); coxæ and tips of tarsi darker. *Wings* (damaged) nearly clear; stigma dark brown, distinct but ill-defined; halteres black, rather large, stems yellow.

Length 3 millim.

♀. *Head* black, shining, eyes long, antennæ jet-black. *Thorax* bright ferruginous, with a thin black dorsal line, which widens anteriorly and extends along the anterior borders of the thorax nearly to the shoulders. *Abdomen* dull ferruginous, dorsum of segments blackish, the first two or three segments nearly wholly blackish on the upperside. Belly ferruginous. *Legs* black, all the coxæ, the fore femora wholly, middle femora wholly, except the tips, and the basal half of the hind femora, bright ferruginous. *Wings* uniformly yellowish grey; stigma large, clear cut, black.

Redescribed from specimens of both sexes in the Indian Museum including the type male and female, which were taken *in cop.* by Major Sage in September 1890 at Dharmsala, Western Himalayas. The other specimens are from Amangarh, Bijnor district, United Provinces, 24. ii. 10; Kurseong, 24. vi. 10.; Theog, 8000 ft., 2. v. 07; Phagu, 9000 ft., 11. v. 09 (*Annandale*); Kumaon district, 5700 ft., vii. 09 (*Imms*); Darjiling, 21. iv. 10 (*Beebe*); Sadon, Upper Burma, 5000 ft., 2. ii. 11, at light.

A female in the same collection from Yunnan, South China, almost certainly represents the same species, and I have seen a pale-legged variety taken by Mr. Imms at Bhowali, 5700 ft., 20. vi. 20, running over *Iris* leaves.

Types in the Indian Museum.

Subfamily SCATOPSINÆ.

The distinctive characters of this subfamily have already been given, on page 159.

There is only one genus that occurs in the Orient, *Scatopse*, Geoff. These are small or minute flies of slender delicate structure, generally black or with a dull reddish tinge about the abdomen; the wings very transparent. The very distinctive venation renders them easily recognisable.

Genus **SCATOPSE**, *Geoff.*

Scatopse, Geoffroy, Hist. Ins. ii, p. 545 (1764).
Scathopse, Geoffroy, Hist. abrégée Ins. ii, p. 544 (1762), (two species mentioned without names).

Genotype, *Tipula notata*, L.; by designation of Latreille (1814), as *T. albipennis*, F.

Head exceedingly small, rounded, enlarged behind. Proboscis not prominent. Palpi unobtrusive, indistinctly jointed, the last joint rather large. Eyes kidney-shaped bare, approximate in male, the frons being therefore very narrow. Ocelli distinct. Antennæ porrect, as long as, or shorter than, the thorax, ten-jointed; 2nd scapal joint cup-shaped, the last flagellar joint oval, the remainder short; bare of pubescence, the whole antenna more or less club-shaped. *Thorax* arched, transverse suture absent, but the front third of the dorsum puffed up and protuberant. Scutellum short and broad. *Abdomen* approximately linear, rather wider behind, of seven or eight segments, pointed in the female. Genitalia generally distinctly visible. *Legs* very short and comparatively robust. Fore femora obviously thickened, fore tibiæ unarmed, posterior tibiæ often clubbed; hind metatarsus shorter than the four remaining joints taken together. Pulvilli sometimes very small. *Wings* distinctly broad, longer than the abdomen, folded upon each other in repose, very thin and transparent, sometimes almost invisible. Venation somewhat difficult of determination with exactitude, and a new interpretation of the veins is ventured upon. The two strong veins near the anterior border are recognised by all as the 1st and 3rd longitudinals, the latter often originating from the 1st in such a way that its basal section appears as a "cross-vein" (much as is apparently the case in *Sciara*). I am disposed to consider that the anterior cross-vein is absent and that the strong vein

proximad of, and in a line with, the main length of the 3rd vein is really the 4th longitudinal,* and that it is *coalescent* with the 3rd vein at about the basal angle formed by the latter (as takes place in two subfamilies of MYCETOPHILIDÆ †); forking afterwards at a varying distance according to the species. The 5th and 6th veins present, and apparently occasionally the 7th posterior cross-vein absent. Upper basal cell present, lower one absent. Anal lobe of wing distinctly angular.

Range. World-wide.

Life-history. The metamorphoses of a few species are known. The larvæ live in rotting vegetable matter and human ordure, although exceptions appear to occur, as one European species, *S. scutellata*, Lw., is said to feed on the honey-dew of APHIDÆ in the autumn. *Scatopse* larvæ are apodal, cylindrical, with two short points on the sides of the thoracic portion, and also on the eight abdominal segments at the base, the last segment terminating in two divergent setæ. Most of the species in the perfect state are sluggish in their movements and appear at times in immense swarms; nearly all the species occurring in England, for instance, having been recorded as swarming in this manner at some time or other. The imagos are found tolerably freely on umbelliferous flowers, on windows of conservatories, in outhouses, near open drains, and more or less generally distributed. Many are spring species, some autumnal.

134. Scatopse brunnescens, *Brun.*

Scatopse brunnescens, Brunetti, Rec. Ind. Mus. iv, p. 281 (1911).

♀. Whole body and legs dark shining brown, slightly yellowish, tinged here and there with short whitish pubescence.

Head: antennæ with 2nd scapal joint a little longer than the 1st, followed by six short, wide, rounded, flagellar joints, with a long (equally broad at its base), conical terminal joint; the whole antenna with close greyish pubescence. *Abdomen* with the dorsum nearly black, the belly dark brownish yellow. *Wings* with 1st longitudinal vein ending much before middle of wing; 3rd ending some distance before

Fig. 20.—*Scatopse brunnescens*, Brun., wing.

* Schiner regarded the strong vein proximad of the basal part of the 3rd vein as the anterior cross-vein (" small cross-vein " in Schiner's words). In this case it would resemble *Sciara*, but the interpretation appears to me open to criticism. The 4th vein nearly always emerges from the base of the wing, or from the base of the 5th, not from the 3rd, in the middle of the wing.

† MACROCERINÆ and CEROPLATINÆ.

tip, springing from 1st very near base of wing; 4th quits the 3rd immediately beyond the angle of the latter, forking at half its length, the upper branch ending at wing-tip, the lower in a straight line with the petiole, ending at some distance below the wing-tip; 5th vein nearly straight, not reaching margin; 6th much curved at half its length, complete; a short very curved 7th vein apparently present.

Length 2 millim.

Described from one specimen from Peradeniya, Ceylon, 9. viii. 10 (*Gravely*).

Type in the Indian Museum.

135. **Scatopse nigronitida**, *Brun.*

Scatopse nigronitida, Brunetti, Rec. Ind. Mus. iv, p. 281 (1911).

♂ ♀. Wholly shining black with minute black pubescence.

Legs: femora with a tinge of dark brown in certain lights.

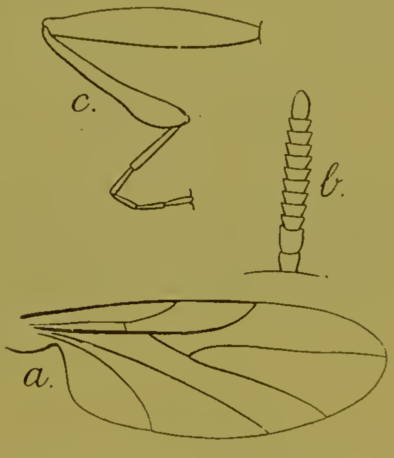

Fig. 21.—*Scatopse nigronitida*, Brun.: *a*, wing; *b*, antenna; *c*, hind leg.

Wings clear; 1st longitudinal vein ending just before middle of wing, 3rd ending just after the middle; 4th quits the 3rd a short distance after the basal angle of the latter, forking very soon afterwards, the branches widely divergent, the upper one ending at wing-tip, the lower one at some distance below wing-tip; 5th vein approximately parallel to petiole and lower branch of 4th; 6th vein curved; anal angle distinct. Halteres thick, brown.

Length 2–2½ millim.

Described from two pairs taken *in cop.*, and an additional male and two females, all in the Indian Museum, from Dharampur, 5000 ft., Simla hills, 14. v. 08, "on trunks of trees" (*Annandale*).

Family SIMULIIDÆ.

There is only one genus in this family, namely *Simulium*, though Prof. Williston speaks of seeing a damaged North American specimen that probably represents a second genus.

From their short thick bodies, broad wings, short legs, and

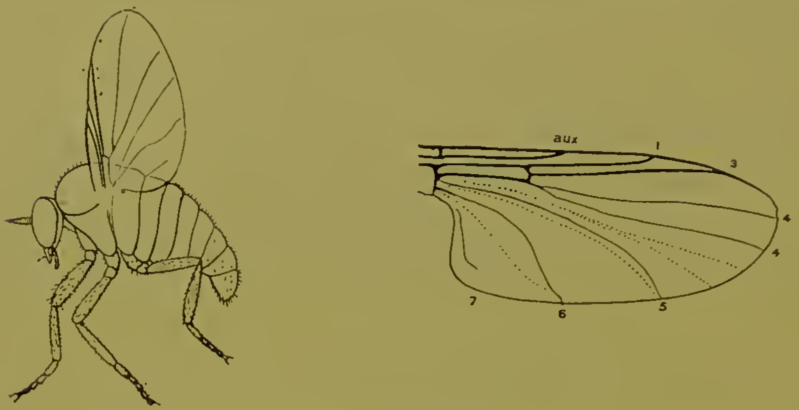

Fig. 22.—*Simulium.*

generally "squat" appearance the SIMULIIDÆ are more unlike the rest of the NEMATOCERA than any other group.*

Their peculiar venation, however, which is totally unlike that of any other family of Diptera, with the exception of the PHORIDÆ in the BRACHYCERA, will at once separate them, even to the beginner's eye.

Genus **SIMULIUM**, *Latr.*

Simulium, Latreille, Hist. Nat. Ins. Crust. iii, p. 426 (1802).
Simulia, auctt.
Atractocera, Meigen, Klass. i, p. 94 (1804).

GENOTYPE, according to Zetterstedt, *S. reptans*, Mg., but Coquillet gives *Rhagio colombaczensis*, Schönb.

Head semicircular. Eyes usually reniform,† sometimes rounded, bare, in life generally of a red colour; contiguous above in the

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* Excepting ORPHNEPHILIDÆ, which are not Oriental.

† Zetterstedt (Dipt. Scand. ix, p. 3415) says the eyes in the male are rounded, reniform in the female. Insufficiency of material prevents my confirming or disputing this; most authors speak of the eyes as "rounded or reniform," the inference being that the shape is not dependent on the sex. As regards their colour Schiner says "generally red in life"; Zetterstedt says "often red in male, obscure in female." The latter author also notes sexual differences in both antennæ and palpi which are not recorded by subsequent writers.

male, the upper facets very much larger than the lower ones, and sharply demarcated from them ; in the female the eyes separated by a moderately broad, nearly linear frons, flat, about one-fourth or one-third the width of the head, all the facets of equal size. Proboscis moderately produced, perpendicular, conical, with two horny labella of moderate size towards the tip. Palpi four-jointed, elongate, cylindrical, incurved; 1st joint short, the following three subequal, or the 4th the longest. Palpi rather longer in the female than in the male. Antennæ short, robust, ten-jointed,* the two scapal joints differentiated, short, the flagellar joints rather thickly annular, subequal in length, the last one sub-conical, all somewhat compressed; with short thick pubescence, no bristles present. *Thorax* ovate, short, highly arched and robust, almost gibbose, bare or with sparse hair. Scutellum small, metanotum not conspicuous. *Abdomen* broad, short, hardly longer than the thorax, very shortly pubescent, of seven or eight segments, the first being distinctly the longest, projecting somewhat over the base of the second, and with a peculiar elevated ridge at the base running across from side to side. The 1st segment also has a more or less fan-shaped row of long hairs on each side towards the lateral margin, which gives the appearance at first sight of large tegulæ with a conspicuous fringe. Genitalia inconspicuous in both sexes. *Legs* quite short and stout, in contradistinction to the usual nematocerous type. Fore coxæ and four trochanters comparatively large; femora flattened, somewhat broad; tibiæ normal, without apical spurs; metatarsus greatly developed, nearly as long as the rest of the tarsus, the four remaining joints short, especially the last; empodia and pulvilli rudimentary. The metatarsus is generally dilated to a greater extent in the male, in which sex the legs are usually rather more pubescent than in the female. The 1st and 3rd tarsal joints generally bear two long hairs each, the character appearing to be common to many species. *Wings* very large and broad, comparatively short, incumbent, bare; costal vein ending at about tip of 3rd longitudinal vein; auxiliary vein and 1st longitudinal ending in the costa; 2nd longitudinal absent; 3rd springing from the middle of the 1st and ending in the costa much before the wing-tip, humeral cross-vein present; subcostal cross-vein absent; anterior cross-vein present, uniting the 3rd vein, near its base, to the 4th vein just before it forks. The above veins, including the costa and the basal part of the 4th longitudinal (*i. e.*, up to the anterior cross-vein) strongly developed and somewhat approximate to one another. The remaining veins very faint. The 4th vein forked, the 5th, 6th, and 7th veins simple, the 6th being strongly bi-sinuate; all these veins attaining the border of the wing or very nearly so. Some spurious veins or "folds" of the wings appear as additional veins, and must not be confused with the real veins

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* Zetterstedt is in error in describing the antennæ as eleven-jointed.

These "fold" veins comprise one between the lower branch of the 4th and the 5th veins, forking at its middle, and a second one lying close behind and parallel to the 5th vein. The anal lobes of the wings are fully developed, the tegulæ or squamæ inconspicuous.

Range. Fossil species are recorded from the Purbeck Beds in England, six by Loew from Prussian amber, and one by Guérin from Sicilian amber. The recent species occur in all parts of the world.

Simulium fully deserves the title of one of the insect pests. The males are reputed to be harmless, occurring mostly in woods, where they may be found performing the aërial dances under branches of trees (sometimes at considerable heights) so common to many kinds of Diptera. They are said to suck the juices of leaves and the honey-dew secreted by aphides; the females of some species bite viciously, and as they occur occasionally in vast numbers they cause great suffering to cattle and often to man himself. One European species, *S. columbaczense*, has frequently been an absolute plague to cattle during brief periods in Central Europe, especially in the valley of the Danube, the flies attacking all the orifices of the body, the eyes, ears, nostrils, and so on, their bites producing an inflammatory fever, often with fatal results. Schönbauer, as long ago as 1795, wrote of *S. columbaczense* being a scourge at times in Hungary. Fries, Zetterstedt, Wahlberg, and other early writers also testify to their occasional excessive abundance and to the injuries caused to men and animals by their bite. De Geer states that some species attack caterpillars, sucking their blood, and that this does not appear to incommode the caterpillar. *S. reptans*, Mg., occurs in Lapland even during the depth of winter, and frequently appears throughout Scandinavia in vast numbers. Other species also occur in snowy regions.

The term "sand fly" is often applied to species of this genus, why, it is hard to say, since they do not appear to be especially partial to sandy localities, and they certainly do not breed in sand.* The expression "sand fly" has also been made use of in reference to some PSYCHODIDÆ, and sometimes for species of *Ceratopogon* (CHIRONOMIDÆ). Though inapplicable legitimately to any of these groups, the term has usually been employed to designate *Simulium*. "Buffalo gnats" and "turkey gnats" are American terms for them, but the generic term "eye fly," employed in India for a minute species of fly that hovers incessantly in front of the eyes, is sometimes incorrectly applied to them.† It is not, however, at all certain that there are not several

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* Riley describes the life-history of a North American species (*Simulium meridionale*, Riley) in the Rep. Dep. Agric. Ent. Wash. 1887 (1886), pp. 492–517. This species is said to cause the death of thousands of turkeys and chickens yearly in Virginia.

† The "eye fly" of Ceylon, according to Mr. E. E. Green, is an Acalyptrate Muscid, determined by E. E. Austen as *Siphonella* (*Microneurum*) *funicola*, Meij.

species. probably of quite different families, included under the general title of "eye fly," as from personal experience (but speaking from memory) I think that both small CERATOPOGONINÆ and even minute EMPIDÆ have been brought to me as "eye flies."

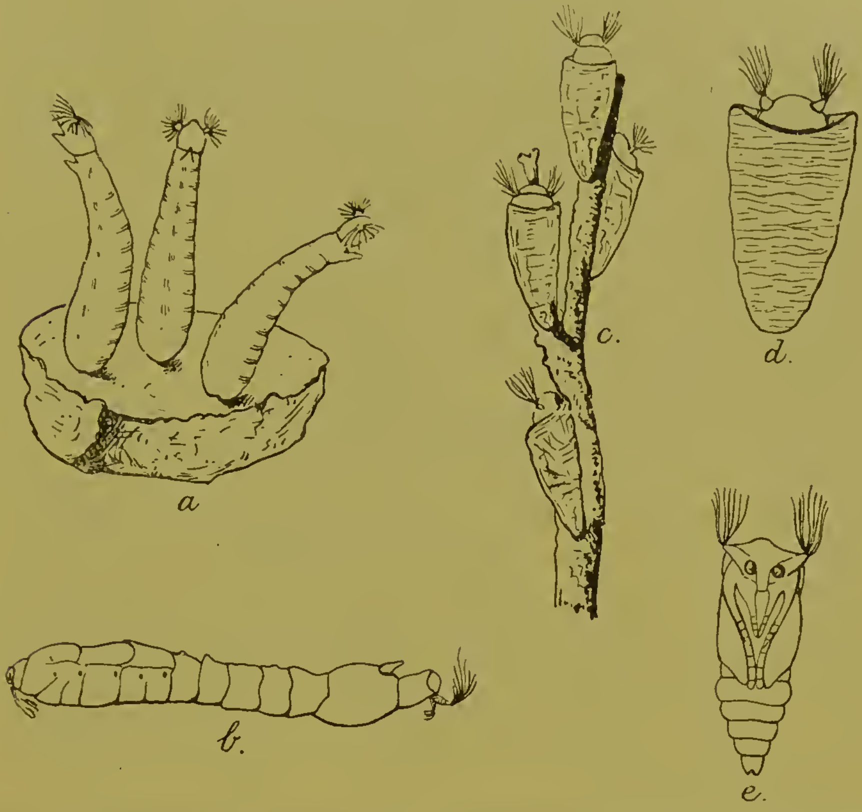

Fig. 23.—Early stages of *Simulium* : *a*, group of larvæ ; *b*, larva of *S. ornatum*, Mg., a European species ; *c*, group of pupæ ; *d*, pupa in its case ; *e*, pupa (after Miall).

Life-history. The larva of *Simulium* is aquatic, living mostly in mountain streams, in the stems of water-plants (*Phellandrium*, *Sium*, etc.), or attached by the tail-end to rocks covered by swiftly running water, their bodies being held vertically. Their chief requirement is that the water shall be well aërated, but the water itself need not necessarily be pure, as the larva of *S. reptans* has been found in Europe swarming in streams contaminated by sewage. The food of the *Simulium* larva is microscopic, diatoms and desmids. The power of attachment is very considerable, its swimming power very weak. It is cylindrical, soft-skinned, narrowed in the middle, enlarged at the end, possessing two pairs of eye-spots, two large fan-like branched antennæ, and on the underside of the first thoracic segment a foot-like protuberance with bristly hooklets or teeth ; this structure forms a sucker and is constructed by the coalescence and development of the first pair

of legs. At the tail there is a similar sucker, formed in like manner. No legs in their normal form are present. Williston says the ultimate segment is furnished with several curved appendages for attachment, so that probably various modifications occur in the larvæ of different species.

The pupa is generally enclosed in a membranous cocoon which is incomplete at the upper end, much resembling an empty egg-shell with the top cut off. This is fastened to the stems of plants. Audouin asserts that the larva spins an entire cocoon first and then eats away the upper portion, the presumption being that the water may reach the eight long filiform appendages (breathing tubes) arranged in fan-shape form on each side of its upper end. These appendages are arranged in pairs, and a similar structure exists in the pupa of *Chironomus*. The perfect insect emerges below the level of the water, and the process has been excellently described by Verdat as far back as 1822.* It is also graphically portrayed by Prof. Miall,† whose account is here reproduced.

"During the latter part of the pupal stage, which lasts about a fortnight in all, the pupal skin becomes inflated with air, which is extracted from the water and passed, apparently, through the spiracles of the fly, into the space immediately within the pupal skin. The pupal skin thus becomes distended with air, and assumes a more rounded shape in consequence. At length it splits along the back in the way usual among insects, and there emerges a small bubble of air which rises quickly to the surface of the water aud then bursts. When the bubble bursts, out comes the fly. It spreads its hairy legs and runs upon the surface of the water to find some solid support up which it can climb. As soon as its wings are dry it flies to the trees and bushes overhanging the stream."

This author adds that some species winter as larvæ and are double-brooded, the first brood appearing in April and May, the second in August. The eggs are laid in large numbers in a gelatinous mass on the stems of water-plants and are yellow in colour, with a thick shell, having some resemblance to the eggs of *Chironomus*.

Hagen speaks of the pupa-cases of a North-American species (*S. pictipes*, Hagen) being affixed in considerable numbers to the rocks in swiftly running mountain streams and adds that they resembled wasps' nests in appearance.

Recent investigations by Dr. Sambon in Italy have practically established the connexion between the disease pellagra and some species of *Simulium*. The outbreaks of the disease are said to be confined to those districts infested by the fly, and to those periods during which the insect is on the wing, the exact times of appearance and disappearance of both the disease and

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* Naturw. anz. allg. Schw. Gesellsch. (1822). Translated by Osten Sacken in the "American Entomologist," ii, p. 229.

† "The Natural History of Aquatic Insects," p. 185 (1895).

the fly synchronizing with or closely following upon the climatic variations from one season to another. The disease is non-contagious, and the parasite has not been actually discovered. It was previously thought to have been caused by eating diseased maize, but Dr. Sambon's investigations have placed its origin with *Simulium* beyond a shadow of doubt.

Simulium has a synonym in *Melusina*, Mg., 1800, but the latter name is unorthodox, no species being allotted to it ; moreover, Latreille's name has been so long in use that it ought not to be changed.

Table of Species.

1. Thorax black, at most with a dull reddish brown tinge occasionally	2.
Thorax distinctly reddish brown, with short yellow hair	*rufithorax*, Brun., p. 187.
2. Thorax with grey shoulder spots and a wide greyish band on posterior margin.	*grisescens*, Brun., p. 188.
Thorax without either grey shoulder spots or posterior bands	3.
3. Abdomen destitute of any sign of yellow hair	4.
Abdomen with short bright yellow hair or with long rather shaggy brownish yellow hair	6.
4. Hind metatarsus much incrassated, nearly as long and large as the tibiæ *	*metatarsale*, Brun., p. 189.
Hind metatarsus not so conspicuously incrassated, distinctly less in size than the tibiæ *	5.
5. Antennæ wholly black. Length $2\frac{1}{2}$ mm.	*griseifrons*, Brun., p. 190.
Antennæ reddish yellow at base. Length $1\frac{1}{2}$ mm.	*rufibasis*, Brun., p. 190.
6. Abdomen with normal short very bright yellow hair	7.
Abdomen with distinctly longer, shaggy brownish yellow hair	*senile*, Brun., p. 191.
7. Abdomen with at least the first two segments distinctly yellowish or brownish yellow ; often several segments so coloured	*indicum*, Becher, p. 191.
Abdomen all black	*aureohirtum*, Brun., p. 194.

136. Simulium rufithorax, *Brun.*

Simulium rufithorax, Brunetti, Rec. Ind. Mus. iv, p. 282 (1911).

♂ ♀. *Head* : eyes dull red, the upper facets in the male very large, the lower ones small, sharply demarcated from each other, the eyes being absolutely contiguous from the extreme vertex to the antennæ. In the female, the facets uniformly small, the frons

* This is probably a sexual character, but no better one offers itself, and the two forms may possibly be male and female of the same species.

dark grey, nearly blackish, covered with golden yellow hairs. Proboscis and palpi blackish, the former with well-developed labella at the tip, the latter with the first joint distinctly the largest.* Antennæ more or less reddish brown in the type male, the scape and two basal flagellar joints reddish,† in one female wholly red, in the other only slightly so at the base; in all cases with whitish pubescence over the whole flagellum. A row of whitish hairs behind the eyes encircling the back of the head. *Thorax* wholly rather dull but obviously reddish brown on dorsum, covered with bright golden yellow hairs; sides of thorax wholly blackish grey. Scutellum reddish brown, metanotum dark grey. *Abdomen* blackish, the posterior margins of the segments very narrowly whitish, dorsum with a few pale scattered hairs. *Legs*: apparently normally the coxæ and femora dull reddish brown or brownish yellow, the tibiæ and tarsi blackish, but the brownish colour extending at least to the hind femora in one of the female specimens. Hind metatarsus much enlarged in both sexes, especially so in the male, in both sexes as long as, or slightly longer than, the rest of the tarsus and about two-thirds as long as the tibia. *Wings* clear, venation normal. Halteres brownish or blackish.

Length 2 millim.

Described from one male from Kanara, Bombay, viii. 07, and two females from Karwar, Bombay, viii. 07. Two females in the Indian Museum are from Kurseong, 10–26, ix. 09 (*Lynch*), and 7. ix. 09 (type female) (*Annandale*).

Type male in the Pusa collection, type female in the Indian Museum.

137. Simulium grisescens, *Brun.*

Simulium grisescens, Brunetti, Rec. Ind. Mus. iv, p. 283 (1911).

♂. *Head* set very close on the thorax. Eyes with conspicuously large facets on upperside; a moderately narrow face below the antennæ light grey. Antennæ black, with rather thick short grey pubescence; scape brownish yellow. Proboscis blackish, yellowish at tip; palpi black. *Thorax* deep velvet-black, evidently originally covered with the short bright yellow hairs common to most of the Oriental species, shoulders with a broad and square spot of pale blue greyish dusting, the inner corner of the spot nearly rectangular; also a broad similarly coloured band on the posterior margin. This rather gives the appearance of the dorsum being of a blue-grey ground-colour, with a broad deep black transverse band occupying the major portion of the surface and a contiguous perpendicular broad stripe reaching to the anterior

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* In the original description the *last* joint was erroneously given as the largest.

† Under a strong light, the microscope reveals the whole antenna as dull reddish brown, though the flagellum appears mainly black to the naked eye.

margin. Sides of thorax with conspicuous blue-grey dusting; scutellum blackish, metanotum black. *Abdomen* black, apparently with a little brownish yellow pubescence; 1st segment with blue-grey sheen, the fan-like side hairs brownish yellow. Belly black. *Legs*: fore coxæ pale yellowish, posterior coxæ blackish grey; fore femora principally brownish yellow, a little blackish towards the tip; posterior femora blackish, the base shortly yellowish; fore tibiæ and tarsi shining black, the proportions of the joints as in *S. indicum*, but the *three* first tarsal joints are widened, although none of them to such an extent as in that species; 4th and 5th joints very narrow. Middle tibiæ black, narrowly yellowish at base; metatarsus yellowish, black at tip, rest of tarsus black, the joints narrowly yellowish at base. Hind tibia considerably widened, black, very narrow at base, where it is a little yellowish; hind metatarsus much enlarged, basal half yellowish, the rest black; remainder of tarsus black, base of 2nd joint a little yellowish. Hind metatarsus much longer than the rest of the tarsus and practically as long as the tibia. Both hind tibia and metatarsus with long hairs on the upperside. *Wings* quite clear, venation normal. Halteres bright yellow, large and thick.

Length $1\frac{1}{2}$ millim.

Described from a unique male in the Indian Museum from Kurseong, taken by Mr. Lynch, 10–26. ix. 09.

This is a very distinct species, recognisable by the bluish grey markings on the thorax and the tinge of the same colour on the first abdominal segment. The widening of the third fore tarsal joint is also a specific distinction, and is noticeable when specimens of *S. grisescens* and *S. indicum* are placed side by side.

138. Simulium metatarsale, *Brun.*

Simulium metatarsalis, Brunetti, Rec. Ind. Mus. iv, p. 284 (1911).

♂. *Head* very closely applied to the thorax. Eyes contiguous from vertex to antennæ, upper facets very large. Proboscis and palpi black. Antennæ black, with close greyish pubescence. *Thorax* black; dorsum with close bright yellow hairs which appear reddish orange when viewed from certain directions. Scutellum black, with yellow hairs. Sides of thorax and metanotum black. Lower part of thorax anteriorly with grey dusting. *Abdomen* wholly black, with rather sparse black pubescence, no trace of gold hairs. Belly similar. The hairs towards the sides of the 1st segment light brownish. *Legs*: fore coxæ yellowish, posterior pairs blackish; fore femora and tibiæ dull yellowish, with golden yellow hair nearly as far as the tip of the latter, which, with the whole tarsus, is black; the tarsus narrow, of equal width throughout; in spite of the gold hair the fore tibiæ viewed from above appear whitish grey. Middle femora and tibiæ slender, basal half of each yellowish, with some yellow hair, apical half black, as are the slender middle tarsi. Hind femora mainly black, slightly pale yellowish at base, tibiæ much incrassated, basal half yellowish,

with golden-yellow hair; metatarsus much incrassated also, nearly as large as the tibia, relatively larger than in any other Oriental species, the basal half yellowish; rest of tarsus black. The hind tibiæ and metatarsi with numerous long hairs on upperside. *Wings* colourless, venation normal. Halteres brownish.

Length barely 2 millim.

Described from a perfect unique male from Kurseong, taken 28. iii. 10, by Dr. Annandale.

Type in the Indian Museum.

From the general resemblance between the two species, it seems possible that *S. griseifrons* may be the female of this species.

139. Simulium griseifrons, *Brun.*

Simulium griseifrons, Brunetti, Rec. Ind. Mus. iv, p. 285 (1911).

♀. *Head*: frons between one-third and one-fourth the width of the head, grey dusted, without any vestige of gold hair; face convex, blackish. Proboscis and labella reddish brown; palpi black. Antennæ wholly black. Back of head blackish grey (seen from above, whitish grey), with some black hairs, which form an irregular fringe behind the eyes. *Thorax* (partly denuded) black, apparently covered with short golden yellow pubescence. Scutellum black, covered with gold pubescence and with a row of long soft black hairs on hind margin. Sides of thorax blackish. *Abdomen* black, the extreme edge of each segment pale. *Legs*: fore coxæ dull brownish yellow, posterior coxæ black. Femora brownish yellow, apical half black, the colour less pronounced and less extensive on the fore pair. Tibiæ, basal two-thirds yellowish, apical third black; the outer sides of the tibiæ, seen from above, appear whitish. Tarsi black, the anterior ones with metatarsus as long as the rest of the tarsus, but only slightly wider; hind metatarsus considerably incrassated, distinctly longer than rest of tarsus, and with the basal half yellowish white. *Wings* clear; venation in accordance with the generic characters. Halteres pale yellow.

Length nearly $2\frac{1}{2}$ millim.

Described from one female from Kalighat, Kumaon, 6000 ft., Western Himalayas, taken by Mr. A. D. Imms, 4. vi. 10.

Type in the Indian Museum.

Possibly the female of *S. metatarsale*. The only distinctive character between them seems to be the difference in the size of the hind metatarsus, and this is probably sexual.

140. Simulium rufibasis, *Brun.*

Simulium rufibasis, Brunetti, Rec. Ind. Mus. iv, p. 285 (1911).

♀. *Head*: frons blackish grey, without trace of gold hair, face light ash-grey. Proboscis and labella dull dark reddish brown; palpi black. Antennæ black, basal two or three joints reddish yellow. *Thorax* as in previous species, except that the scutellum

is slightly reddish brown at the tip, and that (being denuded) no golden yellow hair is visible on its dorsum, though such is probably present in perfect specimens. *Abdomen* wholly black, dull. *Legs*: fore coxæ yellowish, posterior coxæ black; all trochanters brownish yellow. Femora black, but fore pair a little yellowish at the base. Fore tibiæ whitish yellow, except a little blackish at the tip; posterior tibiæ yellowish on basal half, blackish on apical half. Tarsi exactly as in the previous species. *Wings* clear; venation normal. Halteres bright yellow.

Length $1\frac{1}{2}$ millim.

Described from a single female in the Indian Museum, taken by Dr. Annandale at Kurseong, 18. vi. 10.

141. **Simulium senile**, *Brun.*

Simulium senilis, Brunetti, Rec. Ind. Mus. iv, p. 288 (1911).

♂. *Head*: eyes closely contiguous, the head applied very closely to the thorax. Proboscis, palpi, antennæ and underside of head wholly black. *Thorax* black, with short bright yellow hair. Sides black, with a little greyish reflection. Scutellum black, with bright yellow hair; metanotum black. *Abdomen* black, with moderately sparse but rather ragged yellowish or brownish yellow hairs, which are distinctly longer than in any other Oriental species and present an appearance of shagginess. The 1st segment has the charactistic (generic) ridge a little pale, with, towards each side, very long shaggy brownish yellow hair which reaches nearly to the middle of the abdomen. *Legs*: fore coxæ pale yellowish, posterior coxæ blackish. All femora yellowish, a little darker at the tip, especially the hind pair. All tibiæ dirty yellowish, a little darker towards the tip; both femora and tibiæ with golden yellow hair, which is less obvious on the latter. Anterior tarsi black, narrow, not at all enlarged, metatarsus equal in length to the remainder of the tarsus, the whole tarsus about as long as the tibia; hind metatarsus enlarged, two-thirds as long as the tibia, yellowish, the tip black, remainder of tarsus black with the bases of one or two of the joints a little yellowish. *Wings* colourless, venation normal.

Length 3 millim.

Described from a single male in good condition in the Indian Museum taken by Dr. Annandale, 8. v. 07, at Phagu, 8700 ft., Simla district.

The length and somewhat shaggy appearance of the hair on the abdomen effectually distinguishes this species from other Eastern ones.

142. **Simulium indicum**, *Bech.*

Simulium indicum, Becher, Journ. Asiat. Soc. Beng. liii, p. 199, pl. xiv (1884).

♂ ♀. *Head* mainly blackish. Eyes of male closely contiguous from vertex to antennæ. Frons of female about one-third of the

head, black, with bright yellow hair; face whitish grey, with some yellow hairs. Antennæ of male wholly brownish yellow; of female black, scape reddish brown or brownish yellow, but the colour extending to more or less of the flagellum. Proboscis black, tip brownish; palpi black. *Thorax* velvet-black, with close, short, bright yellow hair, the shoulders narrowly yellowish brown, occasionally broadly so; no reddish tinge to dorsum. Sides of

Fig. 24.—*Simulium indicum*, Becher: *a*, palpus; *b*, front view of head.

thorax distinctly grey, occasionally with a grey-dusted band along the lateral margins of the dorsum, which in such specimens, viewed at a low angle from behind, appears wholly whitish grey. Scutellum black, with yellow hair; metanotum black. *Abdomen* black, the basal segments always to a greater or less extent

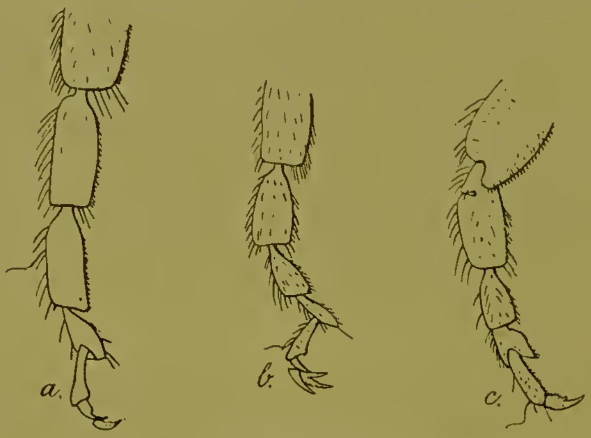

Fig. 25.—*Simulium indicum*, Becher: *a*, fore tarsus; *b*, mid tarsus; *c*, hind tarsus.

yellowish, or brownish yellow, the colour often reaching to the middle, occasionally nearly to the tip of the abdomen. The whole dorsum bears bright yellow hairs as on the thorax. Belly usually pale to the same extent as the dorsum. The extent of the yellow on the abdomen is very variable, in the series of specimens examined. *Legs*: fore coxæ brownish yellow, posterior coxæ black. Femora and tibiæ both normally brownish yellow on the

basal half, black on the apical half, but the proportionate extent of each colour very variable: usually the fore femora principally brownish yellow, in some instances wholly so. Tibiæ with shining yellowish-white sheen; or even silvery-white, on the outer side, seen from above. Fore tarsi of male wholly black, not widened, metatarsus barely as long as the rest of the tarsus; the whole tarsus a little longer than the tibiæ. Hind metatarsus of male much widened and vertically compressed, three-fourths as long as the tibia, distinctly longer than the rest of the tarsus, yellowish on the basal half or two-thirds, the second tarsal joint also sometimes yellowish at the base; middle tarsi in both sexes about as long as the tibiæ, the metatarsus as long as the rest of the tarsus. In the female the whole fore tarsus is deep black, the metatarsus and second joint much widened, metatarsus two-thirds as long as tibia and rather less long than the rest of the tarsus, the whole tarsus distinctly longer than the tibia; hind tarsi as in male and similarly coloured. All the legs bear more or less yellow hair, but less conspicuously so than in *S. aureohirtum*. On the tarsi the hair is deep black. Moreover, the pale parts in the legs of the male are very pale yellowish, almost whitish yellow. *Wings* colourless, venation normal. Halteres yellow, rather large and thick.

Length 2-2½ millim.

Redescribed from two males (Bombay, 25. xi. 09), one of which may now be considered the neotype of the species, only the female having been previously described, and the whereabouts of the typical specimen, even if still existing, being unknown. Also a small series of females in the Indian Museum collection bearing the following data:—Darjiling, 12. viii. 09 (*J. T. Jenkins*); Kurseong, 10–26. ix. 09 (*Lynch*); Simla, 24. iv. 07 (*Annandale*); Sylhet, 2. iii. 05, 18. iv. 05 (*Lt.-Col. Hall*); also three from Bamou and Thadiar, 3500 ft., Tons Valley in the N.W. Himalayas (*C. W. Rogers*); Khasi Hills. Two other females in the same collection appear to represent a variety with wholly black abdomen; they come from Darjiling, 10. viii. 09 (*Paiva*), and Ukhrul, Manipur, 6400 ft. (*Pettigrew*).

Type ♀, location unknown. *Neotype* ♂ in the Indian Museum.

Dr. Becher originally described this species from Indian Museum specimens labelled merely "Assam," and had only the female before him, There are now no specimens authoritatively named by him in the Indian Museum collection, so that the whereabouts of the type female is unknown. The only males are those described by me herein, from Bombay, and preserved in the above collection, one of which in the circumstances may be regarded as a neotype. The second male (not the neotype) has the pale colour on the first abdominal segment much less distinct than is usual.

The fly is called the "potû" fly locally and it probably is distributed along a considerable portion of the Himalayas, Assam and the adjacent regions. In the north-western parts of India it

is said to occur at times in very great numbers, causing serious irritation and sores on the skin of persons bitten.* The chief time of appearance is the dry season (April, May and June), though the insect is not uncommon in the valleys during February and March. It disappears during the rainy season. Its life-history is unknown.

"The insect flies noiselessly and its bite in the first instance is so painless that the creature is seldom noticed at work until its yellow and black body is to some extent coloured with the blood it has absorbed." (*Cotes.*)

Mr. de Nicéville records it as plentiful at Mussoori, Western Himalayas, in the spring and that it occurs there sparingly all the year round. Also in Baltistan, at an elevation of from 3000 to 10,000 ft., where it bites viciously. The fly attacks chiefly the ears, and to a less extent the eyes; its bite is reputed sometimes to be fatal.

In the Western Himalayas it is called the "potû" in Hindustani, "phisniari" in Pehari, and "phisho" in Balti.

It may be noted here that Dr. Becher was in error in describing the tibiæ as possessing spurs, these not being present in the genus at all; but the *hair* at the end of the tibiæ frequently becomes matted together and actually appears at times almost exactly like a thick spur. This probably led to his mistake.

143. Simulium aureohirtum, *Brun.*

Simulium aureohirtum, Brunetti, Rec. Ind. Mus. iv, p. 287 (1911).

♂ ♀. *Head*: the large upper facets of the eye in the male relatively smaller than in the other species, the eyes closely contiguous from vertex to antennæ. Antennæ dull reddish brown, varying to nearly black; sometimes the scape and one or two basal flagellar joints pale also, the remainder blackish; occasionally the whole antennæ brownish yellow. Frons nearly one-third of the head in female, blackish grey with, rather thick bright yellow hair; face dark grey with a few yellow hairs. Proboscis and palpi blackish or dark brown. *Thorax* blackish, occasionally with a slight dull reddish-brown tinge; with close bright yellow hair covering the whole of the dorsum; shoulders sometimes reddish brown, the colour occasionally extending narrowly along the anterior margin of the thorax. The sides blackish grey, bare. Scutellum normally black, but sometimes reddish brown, always with close yellow hair. Metanotum blackish. *Abdomen* blackish, with golden-yellow hair; in some specimens the characteristic ridge on the first segment is pale on the hind margin; the usual

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* Various methods of preventing their attacks and remedies after being bitten, are detailed by Mr. de Nicéville in "Indian Museum Notes," iv, no. 2, p. 54. Deodar and eucalyptus oil have been recommended for keeping them away.

fan-shaped row of yellow hairs towards each side on the first segment. Belly black. *Legs*: normally, fore coxæ brownish yellow or pale yellowish, posterior coxæ black or blackish grey, Femora principally reddish brown or brownish yellow, with a broader or narrower apical band, this band generally wide on the posterior legs; often the fore femora wholly pale; sometimes the remaining femora also almost wholly so. Tibiæ generally with the basal half (or rather more) brownish yellow, the remainder black, sometimes wholly dark brown or brownish black; a slight whitish grey sheen is visible in some specimens when viewed from above. Tarsi blackish or dark brown, basal half of metatarsus normally pale, the extent of the colour varying considerably; fore tarsi (male and female) not widened, metatarsus barely as long as rest of tarsus, whole tarsus distinctly longer than tibia; middle tarsi in both sexes about as long as the tibia, metatarsus equal to the remainder of the tarsus; hind tarsi of male considerably thickened, three-fourths as long as tibia, and distinctly longer than the rest of the tarsus, the whole tarsus a little longer than the tibia; hind tarsus of female of the same proportion as in the male, but less thickened. The coxæ, femora, outer side of tibiæ, and the underside of the hind metatarsus (the latter in male only) bear golden-yellow hair more or less prominently in male, more sparsely in female. *Wings* clear, venation normal. Halteres brownish or brownish yellow.

Length 2–3 millim.

Described from two males and two females from Umling, Assam, iii. 07 (including type male), and several females from Kanara, Bombay, viii. 07 (including type female), all in the Pusa collection.

Although none of the specimens are in good condition, the specific characters as illustrated by the full series seem to be sufficiently distinctive from *S. indicum* to warrant a claim to specific rank. The differences I perceive are, (i) the abdomen is wholly black, instead of yellowish at the base; (ii) the blackish grey, not whitish grey sides to the thorax; (iii) the barely widened fore tarsi in the female, compared with the conspicuously widened first two joints in *S. indicum*. The amount of bright yellow hair also appears greater in this species, especially on the legs.

Family PSYCHODIDÆ.

The members of this family are all very small moth-like flies, closely covered with thick bristly hairs which extend to the legs, the wings also invariably being closely hairy. Scales, too, form an important part of the vestiture, being generally present on the legs and wings and on other parts of the body.

Head small, narrower than the thorax, set low down on the latter, arched, in some genera considerably developed posteriorly. Frons broad in both sexes. Eyes kidney-shaped, bare; ocelli absent. Proboscis rather short, inconspicuous (PSYCHODINÆ) or long and comparatively prominent (PHLEBOTOMINÆ). Palpi incurved, four- or five-jointed. Antennæ comparatively long, if bent backwards reaching the hinder part of the thorax; usually of 15 or 16 joints (rarely 12); the two basal joints differentiated, the flagellar joints more or less lengthened, with verticillate hairs. *Thorax* convex, often greatly arched, densely pubescent in all parts. Scutellum rounded, very small and inconspicuous; metanotum well developed. *Abdomen* moderately arched, cylindrical, only a little longer than the thorax, six-, seven-, or eight-segmented; segments in PSYCHODINÆ somewhat compressed, the abdomen much more elongate in PHLEBOTOMINÆ; in all the species covered with close thick hairs. Genitalia of the male consisting of two (PSYCHODINÆ) or three (PHLEBOTOMINÆ) pairs of appendages; in the female, of a horny, slightly curved, pointed ovipositor (PSYCHODINÆ) or withdrawn within the body (PHLEBOTOMINÆ). *Legs* rather short (PSYCHODINÆ), or moderately long (PHLEBOTOMINÆ); metatarsus often much lengthened; claws small; pulvilli often rudimentary. Legs thickly pubescent, with more or less bristly hairs, generally with closely applied scales also, with bands or circlets of larger scales in many species. *Wings* moderately broad, elongate or lanceolate in PHLEBOTOMINÆ, broad or very broad in PSYCHODINÆ; the veins always with at least two rows of divaricate depressed bristly hairs; the surface of the wing very often also covered with similar, but finer hairs. Scales normally present, either covering considerable portions of the wing, or forming small spots. In PSYCHODINÆ in a state of repose the wings are held down close to the sides, the costal margin lowermost, which gives them some resemblance to small pubescent homopterous insects, as well as to very small moths.

In *Phlebotomus* they are held in a semi-upright position, whilst in *Brunettia* they are spread out flat. Auxiliary vein very short, 1st longitudinal long; 2nd longitudinal forked, the upper branch again forked; 3rd vein long, simple, always originating before the middle of the wing and ending at the tip of the wing or just below it; 4th forked, 5th and 6th simple, long; 7th present, long in PSYCHODINÆ, absent, or extremely short, in PHLEBOTOMINÆ.

Basal cell short, anterior cross-vein present, near base of wing; posterior cross-vein always absent. Alulæ absent.

Life-history. The early stages are known in the case of a few European species. The larvæ live in rotten vegetable matter, stagnant water and similar habitats. They are cylindrical, with a short, firmly chitinised stigmatic tube at the anal end; the maxillæ not well developed; eye-spots on the head, and the segment behind the head without means of locomotion.

The pupa is inactive, with two long tube-like anterior stigmata.

The adult flies appear to be widely distributed and to be common in nearly every part of the world, generally showing a partiality for moist spots, near water-courses or drains. They are also found running over leaves near the ground, in outhouses and closets, on windows, and distributed generally. They are capable of biting mammals and man, *Phlebotomus* having been known as a blood-sucker for many years. *Psychoda* is said to attack the ankles of persons sitting quietly at a table; this is unlikely, but *Pericoma* might possibly do so.

The PSYCHODIDÆ, as a family, are easily recognisable after a little experience, from their small size, hairy wings and pubescent bodies and (in PSYCHODINÆ) comparatively short legs. Though similar in venation to the CULICIDÆ at first sight, a brief inspection enables the beginner to separate them without difficulty. In the first place the posterior cross-vein is always absent, and the anterior cross-vein is much nearer to the base of the wing than to the middle (the latter being the case in the CULICIDÆ). In the second place the antennæ are verticillate in both sexes, never plumose as is so conspicuously the case in male Culicids. The short legs easily separate the PSYCHODINÆ, but the PHLEBOTOMINÆ have legs almost as long and slender as have the mosquitos, and in this subfamily the venational characters are the most reliable means of ready identification. Confusion with any other family than CULICIDÆ is hardly likely. The CHIRONOMIDÆ and CECIDOMYIDÆ, which bear some resemblance to them, are at once known by their much less complete venation and, less easily, by other structural characters.

Table of Subfamilies.

The 7th longitudinal vein absent or inconspicuous.* The 2nd longitudinal forks at, or only very little before, the middle of the wing. Prongs of upper branch always fork beyond middle of wing (in *P. malabaricus, at* the middle). Genitalia

* In *Phlebotomus papatasii* an exceedingly short 7th longitudinal vein occurs at the base of the 6th, running almost direct to the wing-margin. It is liable to be entirely overlooked, but Grassi figures it, and it is found in *P. perturbans* Meij.

of the male with three pairs of appendages; ovipositor of female without a horny scimitar-shaped pair of valves.... **Phlebotominæ**, p. 199.

The 7th longitudinal vein conspicuously present. The 2nd longitudinal forks quite near the base of the wing; always before the first fourth of the wing's length. Prongs of upper branch always fork before middle of wing. Genitalia of the male with two or three pairs of appendages; ovipositor of female consisting of a conspicuous horny scimitar-shaped projecting appendage, forming a pair of valves .... **Psychodinæ**, p. 217.

Four genera are recognised here in the PSYCHODINÆ, *Psychoda* and *Pericoma*, which never possess conspicuously scaled wings and *conspicuous* chætæ together in the same species; * and *Brunettia* and *Parabrunettia*, in which both scaled wings and tolerably or very conspicuous chætæ on the flagellar joints of the antennæ are simultaneously present. I am still much in doubt, however, as to the limits of both these latter genera.

Eaton's genera are, to my thinking, untenable,† yet the group of species with thickly scaled, broad wings, generally with hairs closely covering the surface also, and with distinct chætæ on the flagellum, seems a well-defined one; all of these possess the venation of *Psychoda* except *superstes*, which, being the first species described, must remain the genotype of *Brunettia*.

In the present state of our knowledge it appears to me that it will eventually be found that the three genera *Psychoda*, *Pericoma*, and *Parabrunettia* all possess some species with and some species without: (1) areas of conspicuous extent on the wings covered with scales; (2) hairs on the *surface* of the wings in addition to those on the veins; and (3) some species with the 2nd longitudinal vein forking before the origin of the 3rd longitudinal vein, whilst other species have the fork beyond the origin of the 3rd vein. None of these can by any means be regarded as generic characters, but they serve very well as primary divisions of the species into groups.

The genital organs have not occupied much attention hitherto, but Dr. Annandale is engaged to some extent on their examination. In dried specimens their exact observation is always difficult.

The presence of the spiral chætæ on the antennæ (so conspicuously developed in *Brunettia superstes*) in *Psychoda distincta*, *Pericoma spinicornis*, and *margininotata*, though much inferior in

* "Conspicuous" is emphasized, as very small chætæ (differing only in size from those in *Parabrunettia*), are found by Dr. Annandale to be present in some species of *Pericoma*. They appear to be absent in most species of *Psychoda*.

† The creation of a number of genera in PSYCHODIDÆ, based on variations in the scales on the wings, seems wholly undesirable, as tending to reduce the family to the level of taxonomic absurdity at present happily to be found only in the CULICIDÆ.

size, affords a further point on which to separate or substantiate species, but they must not be regarded as of more than specific value. Dr. Annandale has also discovered in *Psychoda bengalensis* and *nigripennis* a previously overlooked peculiarity in the shape of a pair of very small bifid chætæ on each joint (except the last) of the flagellum, having the appearance of two pairs of cow's horns. They may, quite possibly, be present in some other species, but require very minute examination, being almost transparent.

Subfamily PHLEBOTOMINÆ.

The principal characteristics of this subfamily are:—(1) the absence of the 7th longitudinal vein, or its reduction to extreme shortness, so much so as to be easily overlooked; when present it runs direct to the wing border, no part of it being parallel to either the 6th longitudinal or the margin of the wing; (2) the forking of the 2nd longitudinal vein, which takes place usually at or very little before the middle of the wing, in contradistinction to the PSYCHODINÆ, in which it forks quite near the base of the wing. Moreover, the prongs of the upper branch of the 2nd longitudinal vein always originate *beyond* the middle of the wing.

Characters of secondary value are the structure of the male genitalia, which possess three pairs of clasping appendages. In the female no horny ovipositor can be seen.

The PHLEBOTOMINÆ are comparatively easily separated from the PSYCHODINÆ, not only by their two primary distinctions, but by their general appearance, which is always more elongate and slender, the wings being much narrower and the legs considerably longer than in the latter subfamily. They have a tolerably close resemblance to the CULICIDÆ, as contrasted with the short, robust, squat, short-legged, broad-winged PSYCHODINÆ.

Genus **PHLEBOTOMUS**, *Rond.*

Flebotomus, Rondani, Mem. prima Ditt. Ital. p. 12 (1840).
Cyniphes, G. Costa, Ann. Accad. Aspir. Natural. i, p. 4 (1843).
Hebotomus, Rondani, Ann. Soc. Ent. France, (2) i, p. 264 (1843).
Hæmasson, Loew, Stett. Ent. Zeit. v, p. 115 (1844).

GENOTYPE, *Bibio papatasii*, Scop.

Head small and rather elongate, prominent, somewhat flattened; the underside produced into a blunt snout, from which issues the fairly prominent proboscis, narrow, cylindrical, and hairy, capable of piercing the skin of man and animals.* Palpi considerably

* Newstead fully describes the mouth-parts (Bull. Entom. Research, ii, p. 59, 1911); and both he and Grassi describe the internal anatomy of *P. papatasii*, Scop., rather fully.

elongate, cylindrical, pubescent, of four obvious elongate joints.* *Antennæ* long and slender, 16-jointed; scapal joints short and thick, the 2nd more or less spheroidal; flagellar joints much thinner and longer, the 1st usually much longer than any of the others, which diminish gradually in length to the tip; all the flagellar joints distinctly verticillate. In at least some species there is on each joint a pair of small distinctly geniculated spines just before the middle.† Eyes oval, more or less emarginate, separated in both sexes by a broad frons. Ocelli absent. *Thorax* much arched, densely pubescent; scutellum small; metanotum rather well developed. *Abdomen* elongate, linear, narrow, eight-jointed, thickly haired. Genitalia of male consisting of three pairs

Fig. 26.—*Phlebotomus papatasii*, Scop. ♀.

of clasping appendages, proceeding from two lateral common stems: or they may be described as forming a single pair of three (vertically) branched claspers, working horizontally. The upper pair is two-jointed, the first joint the longer and larger one; the second joint generally, but not always, pointed at the distal end, but always bearing some stout chætæ; the intermediate pair are

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* Some authors have claimed that there are five joints to the palpi, the first very small, but until the question is placed beyond doubt it is preferable to regard the first section as a basal cone, or in some cases as a constriction of the first true joint. In Newstead's drawing of the palpi of *P. minutus*, Rond., a small first joint, making five in all, is clearly shown.

† Probably Grassi refers to these in his "here and there one can observe a short hair curved and relatively thick," without recognising their true nature.

one-jointed, and much smaller, generally thin and leaf-like; the lower pair are one-jointed, but narrow and elongate, slightly curved. These latter arise from a subgenital plate which represents the ventral surface of the ultimate abdominal segment, the upper parts being absent. A flexible, very slender intromittent organ is present, projecting from between the intermediate appendages, and consists of a pair of very slender delicate valves, from which a pair of chitinous filaments can be extended. In the female the external genitalia are simple, "consisting of two pairs (a superior and an inferior pair) of compressed, more or less leaf-like appendages covered with sensory hairs" (*Annandale*). They become distorted in dried specimens, but may be restored by maceration in caustic potash.* There is no horny ovipositor as in Psychodinæ. *Legs* long and slender, clothed with small scales and pubescence; coxæ lengthened, tibiæ with small apical bristles. The relative lengths of the different joints of the legs vary according to the species.† *Wings* rather narrow, varying with the species, lanceolate, or with the tip more or less pointed. Auxiliary vein very short, ending in the costa much before one-third of the wing's length; 1st longitudinal vein ending at about two-thirds of the wing; subcostal cross-vein at tip of auxiliary vein; the 2nd longitudinal vein forked near the middle, the upper branch again forked at or before half its length; 3rd vein originating near base of wing (at least in basal third of wing), ending at tip of wing; anterior cross-vein always at basal angle of 3rd vein 4th vein forked more or less near its middle, the fork sometimes before, sometimes beyond the fork of the 2nd vein, according to the species; 5th and 6th veins long, 7th absent or extremely short. All the veins nearly straight or only gently curved. The single basal cell very short. Posterior cross-vein probably present ‡ in all species, but indistinct. § All the veins finely pubescent, but

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* In the descriptions of the genital organs under each species I am indebted almost wholly to the work of Dr. Annandale, and to a great extent also in the descriptions of other specific characters.

† How much value may be placed on these proportionate lengths when the differences are very slight it is impossible at present to say. It is best not to place too much reliance on fractional differences.

‡ Schiner says it is absent, but so many figures have come before me with it present that it probably does exist though seen with difficulty. It is hardly likely to be present in some species and absent in others.

§ Newstead makes several errors in his terminology of the wings. The "subcosta" (or auxiliary vein) does not turn *down* into the 1st longitudinal, but *up* into the costa, the small connecting vein being the subcostal cross-vein. The expression that the 2nd longitudinal "extends almost to the base of the wing" is unscientific, as all veins *begin* at their nearest point to the base of the wing, not *vice versâ*. The 3rd longitudinal does not "originate from the mid cross-vein," but turns out of the 2nd at the usual angle, the anterior cross-vein connecting it at the point of angulation with the 4th vein. He speaks of the 5th vein "curving upwards and uniting with the 4th" (still apparently considering the vein to start from the margin of the wing instead of from its basal limit); whereas if there is a short vein joining the 4th and 5th longitudinal near their bases, it is the *posterior cross-vein*. His remaining remarks are therefore erroneous, consequent on his misnaming the veins from the first.

no hairs on the surface of the wings; scales practically absent, or confined to a few small ones at the base of the wings. Alulæ and anal lobe of wing absent; squamæ absent. Halteres rather large; clubs oval, with small concolorous scales at the base.

Range. India, Southern Europe, Northern and Tropical Africa, the southern part of the United States, and Central and South America.

*Life-history.** The larva is known to live in crevices in stone walls, preferring those within one or two feet of the ground where some moisture is always obtainable, and it also occurs, according to Grassi, in corners of cellars and in undisturbed heaps of miscellaneous animal, vegetable, and mineral refuse. Yet it seems to have been seldom actually obtained, Mr. R. Newstead, who made a special visit to Malta for the purpose of finding its breeding-places and studying more closely its life-history, having found but two larvæ after a most protracted search in all the likely localities in the island.

The eggs hatch after nine days, but must be kept in a moist atmosphere.† The larva is cylindrical, distinctly caterpillar-like, white or yellowish white, the caudal bristles long and black. The head is broadly pyriform, with various hairs; the antennæ have three segments, the first two being very minute; the mouth large, provided with blunt teeth. The twelve segments of the body after the head bear four or five hairy spines each on each side, and there are two pairs of anal bristles, one pair nearly as long as the body, the other pair very short. Length of body about $2\frac{1}{4}$ millim.

The pupa is somewhat S-shaped, viewed laterally; the thorax with large wing-sheaths, apically pointed and well clear of the body, the segments of which are distinctly visible; the head is elongate and somewhat triangular in outline; the legs extend a little beyond the wing-sheaths, and the dried larval skin with its long anal bristles is attached to the tip of the pupa.

The species of *Phlebotomus* are quite small, delicate brownish or yellowish moth-like hairy flies, closely resembling other members of this family. From their first recognition they have been known to be blood-suckers, as testified by their generic name. They occur in the basements of houses, bath-rooms, and out-houses, and are in the habit of attacking the ankles whilst one is sitting at table during the evening. Some species may be wholly sylvan, but probably many can be taken "at light" in their respective localities. *Phlebotomus* has been proved to transmit a special three days fever (*Pappatacifieber*) in Southern Europe, and this fever is believed to occur also in some parts of Northern India.‡

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* The description of the larva and pupa herein offered is compiled from Newstead's account (Bull. Entom. Research, ii, p. 47) which is most instructive.

† Newstead's report on the oviposition of *P. papatasii* in captivity is most interesting, the female lying on her back and ejecting the eggs forcibly to some distance.

‡ See Doerr, Franz and Taussig, "Das Pappatacifieber" (Leipsig and Vienna, 1909), and Wall, Indian Med. Gazette, xlvi, p. 41 (1911).

Table of Species.

1. The 2nd longitudinal vein forks nearer middle of wing than at one-fourth. Petiole of 1st submarginal cell always much longer than one-third of the cell's length, *except* in *himalayensis*, in which it forks exactly at one-third .... 2.

   The 2nd longitudinal vein forks exactly at one-third of the wing. Petiole of 1st submarginal cell only one-third as long as the cell .... 8.

2. Tip of 1st longitudinal vein either about half-way between fork of 2nd vein and tip of wing, or nearer tip of wing .... 3.

   Tip of 1st longitudinal vein distinctly nearer fork of 2nd vein than tip of wing. 5.

3. Fork of upper branch of 2nd longitudinal vein nearer fork of 2nd vein than tip of 1st vein. Wing comparativly lanceolate; fork of 2nd vein beyond that of 4th vein. Colour of insect yellowish grey. Genitalia of male with three chætæ at tip .. *himalayensis*, Ann., [p. 204.

   Fork of upper branch of 2nd longitudinal vein nearer tip of 1st longitudinal vein than fork of 2nd vein .... 4.

4. Wing broader; fork of 2nd vein before that of 4th vein. Colour of insect dark greyish brown. Genitalia of male with both the middle chætæ median. Hind femur between one-half and three-quarters as long as its tibia, and distinctly longer than the metatarsus, which is shorter than the rest of the tarsus. Length $2\frac{1}{2}$ mm. .... *perturbans*, Meij., p. 205.

   Wing lanceolate: fork of 2nd vein and that of 4th vein practically opposite one another. Colour of insect silver-grey. Genitalia of male with the middle chætæ subapical. Hind femur nearly as long as its tibia, more than twice the length of the metatarsus, which is shorter than the rest of the tarsus. Length $1\frac{1}{2}$ mm. .... *minutus*, Rond., p. 206.

5. Fork of upper branch of 2nd longitudinal barely before tip of 1st longitudinal vein.* Sides of thorax conspicuously paler than the dark dorsum. Genitalia of male with two chætæ at tip and three median ones. Hind femur less than half as long as the tibia, distinctly shorter than the metatarsus, which is longer than the rest of the tarsus ...... *argentipes*, Ann. & Brun., [p. 207.

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* Implicit reliance must not be placed on absolute precision in this point, as occasional individual exceptions occur.

Fork of upper branch of 2nd longitudinal vein some little distance before tip of 1st longitudinal vein. Thorax more uniformly concolorous	6.
6. Length 3-3¾ mm. Wings comparatively broad. Colour of insect golden grey. Genitalia of male with two chætæ at tip and three median ones. Hind legs as in *P. argentipes*	*major*, Ann., p. 210.
Length 2½ mm. Wings narrower or moderately broad	7.
7. Wings narrower. Colour of insect yellowish grey. Genitalia of male with three chætæ at tip and two median ones. Hind femur between one-half and three-quarters as long as the tibia, and nearly twice as long as the metatarsus, which is shorter than the rest of the tarsus ..	*papatasii*, Scop., p. 211.
Wings moderately broad. Colour of insect rather dark brown. (The male unknown.) Hind femur about half as long as its tibia; equally as long as the metatarsus, which is equal in length to the rest of the tarsus	*argentipes*, var. *marginatus*, Ann., p. 209.
8. Length 2½ mm. Wings purplish, iridescent. Genitalia of male with four chætæ (2 apical, 1 subapical, 1 median).	*malabaricus*, Ann., p. 214.
Length 3 mm. Wings uniformly pale brownish grey. Genitalia of male with five chætæ (2 apical, 3 median)	*zeylanicus*, Ann., p. 215.

The variety *marginatus*, Ann., of *argentipes* is given a place in this table of species because it falls in a different primary division of the genus to that in which the typical form is found, and it might otherwise easily be mistaken for a new species.

144. Phlebotomus himalayensis, *Ann.* (Pl. IV, fig. 10.)

Phlebotomus himalayensis, Annandale, Rec. Ind. Mus. iv, p. 50, pl. iv, fig. 2, and pl. vi, fig. 7 (1910).

♂ ♀. Body covered with yellowish grey bristly hairs, giving the usual silvery reflections, the dorsum of the thorax being rather darker than the sides.

Head: rostrum rounded at the tip, stout and elongated. Antennæ normal, with two circlets of flat scales and one of flattened hairs on the 2nd scapal joint. Palpi five-jointed, the last the longest. *Thorax* much as in *P. minutus*, the dorsum rather darker than the sides, but without the relative difference that there is in *P. argentipes*. *Abdomen* much as in *P. minutus*. Genitalia of male with the distal joint of the upper appendages about half as long as the proximal, bearing at the tip three pointed chætæ, each of which is slightly shorter than the joint; intermediate appendages simple, pointed, curved downwards at the tip; lower appendages slender, distinctly elbowed,

rounded and slightly clubbed at the tip, nearly as long as the basal joint of the upper appendages and devoid of chitinous spines; intromittent organ with two elongate, slender valves, which are truncated at the tip. In the female the appendages are short and broad, the upper ones not much longer than the lower. *Legs* concolorous with the body; anterior femora, tibiæ and tarsi all about equal in length, except that the tarsi appear rather longer; hind femora longer than anterior pairs, their tarsi distinctly longer and about equal to the hind tarsi in length. *Wings* narrow. The 1st longitudinal vein ends at about three-fourths of the wing; the 2nd forks a little before the middle, barely beyond the fork of the 4th vein; the upper branch of the 2nd vein forking at one-third of its length.

Length $2\frac{2}{5}$ millim.

The species occurs in the Himalayas, between 4000 and 7000 ft., Naini Tal and Bhowali, Kumaon district (*Imms* and *Lloyd*); Kurseong, Darjiling district. Apparently common in both districts in May, June, and July.

Types, ♂ and ♀, in the Indian Museum.

Closely resembling *P. minutus* but rather longer and more yellowish. The anterior branch of the 2nd longitudinal vein forks much sooner than in *minutus*, and the fork of the 2nd vein is slightly beyond, instead of slightly before, the fork of the 4th vein.

145. **Phlebotomus perturbans**, *Meij.* (Pl. IV, fig. 11.)

Phlebotomus perturbans, Meijere, Tijd. v. Ent. lii, p. 201, pl. xii, fig. 13 (1909); Annandale, Rec. Ind. Mus. iv, p. 47 (1910).

♂ ♀. Body with bristly hairs reflecting silvery lights from all parts.

Head: rostrum short and thick, rounded at the tip. The 1st scapal joint barely longer than the 2nd, the latter with a circlet of curved scales. Palpi long, five-jointed; 1st joint very short, the 2nd and 3rd much longer than the 4th, the 5th the longest. *Thorax* much as in *P. argentipes* except that the hairs are shorter. *Abdomen* relatively shorter than in *P. major*, clothed with recumbent, bristly, brownish grey hairs and with a few upright curved ones on both dorsal and ventral surfaces. Genitalia of male with upper appendages very long, the distal joint much shorter than the proximal, bearing four chætæ, which are less than half as long as the joint and are arranged in two pairs, an equal pair at the tip and the other (in which the two chætæ are not equal) on the inner surface about half-way along the joint; the proximal chætæ are blunt, the distal ones pointed. The intermediate appendages without a ventral lobe, slender, pointed, with the tip curved; lower appendages shorter than the basal joint of the upper ones, slender, bearing at the tip a bunch of long stout bristles; intromittent organ very slender, the valves rounded at the tip; the genital filaments well developed. In the

female the upper appendages are considerably larger than the lower ones, both leaf-like and rounded at the tip. *Legs* mainly concolorous with body, coxæ and trochanters yellowish, extreme tips of femora with a few minute silvery white scales, more conspicuous than in *P. argentipes*. Hind leg two and a half times as long as the head and thorax; the femur a little more than half as long as the tibia, slightly longer than the metatarsus, which latter is distinctly shorter than the other joints together. *Wings* bluntly pointed, the hairs on the costal border darker than in *P. argentipes*; 1st longitudinal vein ending at two-thirds of the wing; fork of 2nd vein distinctly before centre of wing and of fork of 4th, which latter occurs at the middle of the wing; petiole of 1st submarginal cell equal in length to the cell; the 7th longitudinal vein is distinctly present but very short.

Length 2½–3 millim.

Type in the Amsterdam Museum.

Abundant in the jungle at the base of the Eastern Himalayas at the beginning of the rainy season, large numbers flying to light at Sukna, 500 ft. Darjiling Hills, on the evenings of July 1st to 3rd, 1908 (*Annandale*). It has not been recorded from anywhere else except, of course, originally, from Java. This species may be distinguished rather readily from all other Indian ones except *P. malabaricus* (according to Dr. Annandale) by its dark brownish colour.

146. **Phlebotomus minutus**, *Rond.*

Hebotomus minutus, Rondani, Ann. Soc. Ent. France (2) i, p. 265 (1843).

Phlebotomus sp., Howlett, in Maxwell Lefroy's "Indian Insect Life," p. 559, fig. 358 (1909).

Phlebotomus babu, Annandale, Rec. Ind. Mus. iv, p. 49, pl. iv, fig. 1, and pl. vi, fig. 3 (1910).

♂ ♀. Body with silvery grey appearance and reflections ("dull golden ochreous" according to Newstead); the thorax and abdomen appearing darker in certain lights, clothed with recumbent dull golden ochreous hairs.

Head: rostrum prominent, but somewhat short and arched. The 2nd scapal joint with several rows of flat scales; flagellum nearly normal. Palpi apparently five-jointed, the 1st joint very short but distinct, a little clubbed at the tip, 2nd twice as long as 1st, and half as long as the 3rd, which is much the longest, 4th thinner and shorter than the 3rd, 5th longest of all, very narrow cylindrical. *Thorax* covered with pale ochreous hairs, with a few intermingled black hairs. *Abdomen* rather short, clothed with closely set, upright hairs of different lengths, and with a dense fringe of upwardly curved hairs running along each side of the abdomen near the ventral surface. Genitalia of male with the upper appendage having the basal joint stout, about twice as long as the distal one, which bears four pointed

equal or subequal chætæ; the chætæ rather longer than the joint, situated two at the tip and two at a short distance from it; intermediate appendage short, blunt, with the ventral lobe represented by a short process on its ventral margin; the lower appendage club-shaped, distinctly elbowed, about as long as the basal joint of the upper appendage, bearing (in addition to slender bristles) several chitinous spines at the tip and on the ventral surface. In the female the upper appendage is long and narrow, somewhat curved, the lower one less than half as long, straight. *Legs* concolorous; the hind leg rather less than twice as long as the thorax and abdomen; the femur slightly shorter than the tibia, which is more than twice as long as the metatarsus, the latter less than half as long as the femur, shorter than the remaining tarsal joints together by half its own length. *Wings* narrow, bluntly lanceolate. The 1st longitudinal vein ends at three-fourths of the wing, the 2nd vein forking just before the middle, the upper branch forking at half its length; the 4th vein forking at or immediately before the middle.

Length 2½ millim.

The species occurs in the southern part of Europe; in the Indian Empire probably all over the plains. Dr. Annandale has examined specimens from Rawalpindi, September (*C. W. Mason*); Quetta, Chitral, Allahabad, October (*A. D. Imms*); Rajmahal, on the Ganges, July; Asansol, February (*Paiva*); Purneah, Pusa (*Howlett*); Madhupur; Puri, Orissa; Calcutta at all times of the year; Port Canning; Igatpuri, Western Ghats, Bombay, in November; Poona; Kirkee; Rambha, N.E. Madras; Trivandrum, Pallode and Maddathorai in Travancore in November; and Peradeniya, Ceylon.

Type, the whereabouts of this is uncertain.

The smallest of the Oriental species. It is nearly allied to *P. argentipes*, in company with which it is often taken, and from which it may be distinguished by its smaller size and narrower wings. Newstead notes that this species, which occurs in Malta, is extremely active and has the peculiar habit, at any rate when in captivity, of "whirling round and round with great rapidity, so rapidly at times as to render itself almost invisible." Dr. Annandale regards this as a silvery grey species, but according to Newstead the prevailing colour is dull golden ochreous.

147. **Phlebotomus argentipes**, *Ann. & Brun.* (Pl. IV, fig. 5.)

Phlebotomus argentipes, Annandale and Brunetti, Rec. Ind. Mus. ii, p. 101 (1908).

Var. *Phlebotomus marginatus*, Annandale, Spol. Zeyl. vii, p. 62, fig. 7 (1910).

♂ ♀. *Head* brownish, varying towards yellowish in individuals, with concolorous thick bristly hairs. Eyes large, black, emarginate above; frons narrow. Proboscis stout, elongate; rostrum with upright curved bristles; palpi five-jointed, 2nd joint more than half

the length of the 3rd, which is a long as the 4th and 5th together. Antennæ with 1st scapal joint short, rather slender; 2nd subspherical, bearing a circlet of about twelve slender, spatulate, curved scales, and (nearer the base) a circlet of stiff flattened bristles. Flagellum with three or four somewhat irregular verticils of stiff fine hairs to each joint; 1st joint double the length of the 2nd, the remainder gradually diminishing in length. *Thorax* covered with brown, or brownish yellow, thick bristly hair, with bunches of long, blackish, more or less erect, curved, flattened, bristly hairs, which exhibit silvery reflections in certain lights; these arise from sockets provided with raised rims. Sides of thorax cream-coloured, conspicuously lighter than the dorsum, with bristly hairs around the base of the legs only. Scutellum dark, and, with the metanotum, covered with concolorous hairs. *Abdomen* slender and cylindrical in both sexes, closely covered with blackish bristly hairs, the emargination of the segments often blackish. Genitalia of male with all the appendages long and apparent; the upper appendages with the distal joint considerably shorter than the proximal one, bearing five stout pointed chætæ, each nearly as long as the joint, arranged as follows:—a single chæta at a point about a third of the length of the joint from the base, a pair of slightly unequal chætæ near the middle of the joint, and a terminal equal pair; the proximal joint slightly longer than the last apparent segment of the abdomen; the intermediate appendages small, consisting of a stout, bluntly pointed, dorsal lobe and a small ventral lobe which is a minute pointed process bearing a bunch of bristles at the tip and attached to the ventral margin of the dorsal lobe; the inferior appendages somewhat slender, laterally compressed, longer than the basal joint of the upper ones, obliquely truncated, devoid of spines, covered with stout hairs, which form a dense brush at the tip of the appendage; a distinct elbow not far from the base of the appendage; the intromittent organs are relatively long, ensiform, consisting of two slender, pointed lateral valves, between which a pair of long filaments can be protruded. In the female the upper appendages somewhat widely separated from the lower ones, which are small, pointed, and claw-shaped. *Legs* very long, the hind pair being about three times as long as the thorax and abdomen together; femora much shorter than the tibiæ; metatarsi in all cases at least as long as the remaining tarsal joints combined. All the legs with strong reflections making the tibiæ and tarsi appear silvery white in certain lights; the femora bear narrow flattened spatulate brownish scales and fine bristly brown hairs similar to those of the body; the tibiæ and tarsi covered with closely impressed angularly bent scales, and bearing, especially at the joints, slender stiff straight hairs. *Wings* narrow, obtusely pointed at tip, nearly three times as long as broad at the widest part. The 1st longitudinal vein ends just before two-thirds of the wing's length, the 2nd forking barely before

the middle, the upper branch again forking before half its length.* The 3rd vein begins at one-third of the wing, running straight to the wing-tip, the anterior cross-vein placed at its basal angle; the 4th vein forks just beyond the fork of the 2nd longitudinal, its branches being parallel; 5th vein straight, long; 6th sinuous, long. Basal cell nearly one-third the length of the wing. Scales are present at the base of the wing only, the whole wing having an iridescent silvery groy appearance, though the colour may be best described as smoke-grey; in many specimens the wings are practically clear, with pale brownish yellow or yellowish grey hairs arranged in the usual divaricate method along all the veins.

Length about 2 millim.

Probably distributed all over the plains of India, as it occurs, at least in Calcutta, at all times of the year. In the Indian Museum, from Port Canning, Rajmahal (Feb., July), Asansol and Pusa, in Bengal; Poona; Lucknow; Madras; and at Pallode and Maddathorai in Travancore State, and also at Peradeniya, Ceylon, 1500 ft.

Types in the Indian Museum.

This species is easily distinguished, except in the case of females distended with blood, from all other Indian forms by the strong contrast in colour between the dorsal surface and the sides of the thorax. In *P. himalayensis* the thoracic dorsum is darker than the sides, but the difference is not at all so conspicuous as in the present species. It is found in Calcutta throughout the year but at times is much more abundant, apparently favouring dark spots in the basement of houses and bathrooms, being also often attracted at night by the light of a lamp.

Var. **marginatus**, *Ann.*

♀. Body rather darker than in *P. zeylanicus*.

Legs: the hind leg is less that two and a half times as long as the thorax and abdomen; its femur about half as long as its tibia, of the same length as the metatarsus, which latter is equal in length to the rest of the tarsus; coxæ and femora rather bright shining pale brown. *Wings* with the 1st longitudinal vein ending some little way before three-fourths of the wing; 2nd longitudinal vein forking distinctly before the middle of the wing, the anterior branch forking distinctly beyond it; 4th longitudinal vein forking almost exactly at the middle.

Peradeniya, Ceylon; a single female taken in May.

Type in the Indian Museum.

Although only a solitary specimen is known, this variety is apparently a good one. The venation is rather like that of the typical form of *P. argentipes*, but the upper branch of the 2nd longitudinal vein forks distinctly before the tip of the 1st vein, instead of approximately below the tip; the wing also is narrower.

* The fork of the upper branch of the 2nd longitudinal vein is sometimes considerably more basal than shown in Dr. Annandale's figure, and the wings are not infrequently much less broad.

If the relative lengths of the joints of the leg are safe characters, the variety *marginatus* holds an intermediate position between typical *P. argentipes* and *P. major* together on the one hand, and the remaining species together, on the other.

148. **Phlebotomus major**, *Ann.* (Pl. IV, fig. 7.)

Phlebotomus major, Annandale, Rec. Ind. Mus. iv, p. 46, pl. v, fig. 4, pl. vi, fig. 4 (1910).

Phlebotomus sp., Giles, "Gnats and Mosquitos," 2nd ed. p. 5, fig. 2 (1902).

Phlebotomus major, var. *grisea*, Annandale, Rec. Ind. Mus. iv, p. 320 (1911).

Var. *Phlebotomus perniciosus*, Newstead, Bull. Ent. Research, ii, p. 70 (1911).

♂. Body covered with bristly hairs giving a uniform golden grey appearance, with very strong silvery reflections; disc of the wings with a bluish iridescence. Legs sometimes darker than the abdomen.

Head: rostrum somewhat conical, short, truncated in front. Eyes widely separated, emarginate above. Antennæ very long (if bent backwards they would reach nearly to the tip of the abdomen), with scapal joints subspherical, the flagellar ones elongate, slender, densely covered with soft whitish grey hairs. Palpi with apparently five joints; the basal one very short, the 2nd, 3rd, and 4th subequal, each shorter than the 5th. *Thorax*: in normal specimens ground-colour brown, with bright conspicuous golden yellow hair; in the dark variety much as in *P. argentipes*, though usually brighter yellow. *Abdomen* long and slender, the ground-colour pale brownish yellow, clothed with long recumbent pale yellow hairs and with tufts of longer, upright ones on the dorsal surface. Genitalia of male with upper and lower appendages similar to those of *P. argentipes*, except that they are more slender and elongate, the basal joint of the upper appendage being nearly twice as long as the last apparent joint of the abdomen; the intermediate appendages devoid of a ventral lobe; valves of the intromittent organ slender and blunt; genital filaments well developed. *Legs* generally concolorous with the body, sometimes darker. Hind leg two and a half times a long as head, thorax, and abdomen; its femur less than half as long as the tibia, and considerably shorter than the metatarsus, which is longer than the remaining joints together. *Wings* moderately broad and pointed, the hairs nearly whitish grey. The 1st longitudinal vein ends at two-thirds of the wing's length, the forks of the 2nd and 4th veins are opposite one another; the fork of the upper branch of the 2nd vein some distance before the tip of the 1st vein; the petiole of the 1st submarginal cell half the length of the cell.

Length 3–$3\frac{3}{4}$ millim.

Outer Himalayas; from the base up to 7000 or 8000 ft.; Paresnath Hill in West Bengal in April; Naini Tal, Bhowali (July), Kurseong (April to July), base of Nepalese Himalayas, Simla (July).

Type in the Indian Museum.

A large pale species, rather easily identified by the bright golden yellow hair on the thorax.

Var. griseus, *Ann.*

Dr. Annandale describes a variety *grisea* in which the colour is uniformly darker, greyish or brownish, from several examples taken by him in a house at Kurseong, Darjiling district, 4700 ft., in June 1910; and he recognised the same variety in the same house in the following year. Of two specimens in the Indian Museum, the hair on the thoracic dorsum in one is brownish yellow, in the other nearly the same as in *P. argentipes*.

Var. perniciosus, *Newst.*

A form described by Newstead as a distinct species from Malta is, according to Dr. Annandale, only a variety of his *P. major*, an opinion in which I am inclined to concur, there being no differences in either the venation or the male genitalia. It has not been found in India, but it is well to add the general diagnosis, which is given in the words of the author:—

"*Male.* Colour immediately after death: Eyes black. Thorax with or without dull red-brown spots; when present they are arranged in a triangle, and there is occasionally a similar spot on the vertex of the head. Thorax and coxæ pale translucent ochreous; abdomen similar, but sometimes pale smoky grey. Hairs pallid. Wings faintly iridescent in strong light; pale drab in subdued light; costal fringe generally very dark or blackish grey, though examples with pale costal fringes are not uncommon. Legs silvery grey, in a strong light presenting a distinct metallic lustre; in certain lights also those segments which lie in shadow appear almost black and show up in marked contrast to those which are so placed that their surfaces refract the light. In some lights the under surface of the legs appears distinctly and regularly speckled, a character due evidently to the regular arrangement of the scales. . . .

"*Female.* With the palpi, antennæ, and legs similar to those of the male. Wings very slightly larger and broader than those of the male."

149. Phlebotomus papatasii, *Scop.*

Bibio papatasii, Scopoli, Deliciæ Faun. Flor. Insub. i. p. 55, pl. xxii, fig. B (1786).
Cyniphes molestus, Costa, Ann. Accad. Aspir. Nat., I, p. 4 (1843)
Flebotomus papatasii, Rondani, Mem. Ditt. Ital. p. 13, pl. (1840).
Hebotomus papatasii, Rondani, Ann. Soc. Ent. France, (2) i, p. 265, pl. x, iv, figs. 1–4 (1843).
Hæmasson minutus, Loew (*nec* Rond.), Stett. Ent. Zeit, v, p. 115, pl. i, figs. 1–5 (1844).
Phlebotomus papatasii, Schiner, Fauna Austr. ii, p. 630 (1864); Grassi, Mem. Soc. Ital Sci. (3) xiv, p. 353 (1907); Newstead, Bull. Ent. Research, ii, p. 73 (1911).

Body covered with yellowish or brownish yellow bristly hairs

(said by Grassi to be sometimes darker, even nearly brown, in some females).

Head: from occiput to tip of proboscis, longer than length of thorax. Vertex and occiput with long bristly hairs. Proboscis elongate, rather suddenly narrowed at half its length, tip blunted. Palpi two-thirds as long as the antennæ; situated beyond the last of two or three small transverse bulges or folds towards the lower part of the base of the proboscis. The 1st palpal joint elongate, cylindrical, slightly bent at base, a little constricted below at the bend, giving the appearance of a very short basal joint; 2nd joint subequal to 1st in length, a little thicker; 3rd shorter, 4th as long as the 1st. The first two bear soft hairs, the 3rd two circlets of scales, the 4th covered with closely impressed small scales. Antennæ rather less in length than the thorax and abdomen. 1st scapal joint cylindrical, a little longer than broad; 2nd flattened

Fig. 27.
Phlebotomus papatasii, head of ♀.

Fig. 28.
Phlebotomus papatasii, palpus.

spheroidal, shorter than the 1st; 1st flagellar joint twice as long as the 2nd; the remainder gradually diminishing, elongate-oval, a little more pointed at the distal end, with a verticel of four long hairs at the base of each joint, the rest of the joint irregularly and much more shortly verticillate. *Thorax* considerably arched, covered with yellowish or yellowish grey bristly hairs; scutellum small, with concolorous hairs; metanotum bare. *Abdomen* closely covered with short depressed concolorous hairs, and with a row of longer bristly ones at the hind margins of the segments. Genitalia of the male with a long 1st joint to the upper appendages, the 2nd joint being very slender, with two chætæ beyond the middle,

one subapical and two apical; all the chætæ subequal. The intermediate appendage is trilobed, composed of two short pieces, of which one is almost filiform, the other stouter, broader, curved; the 3rd piece twice as long as the others, much curved, with a fringe of hairs on the concave posterior side. The lower appendages are one-jointed, straight, slender, pointed, with fine

Fig. 29.—*Phlebotomus papatasii*, genitalia of ♂.

hairs, in length about equal to the basal joint of the upper appendages but much more slender. Genitalia in female with upper and lower appendages only, widely separated from one another, both short, oval, inconspicuous, pubescent. *Legs*: fore

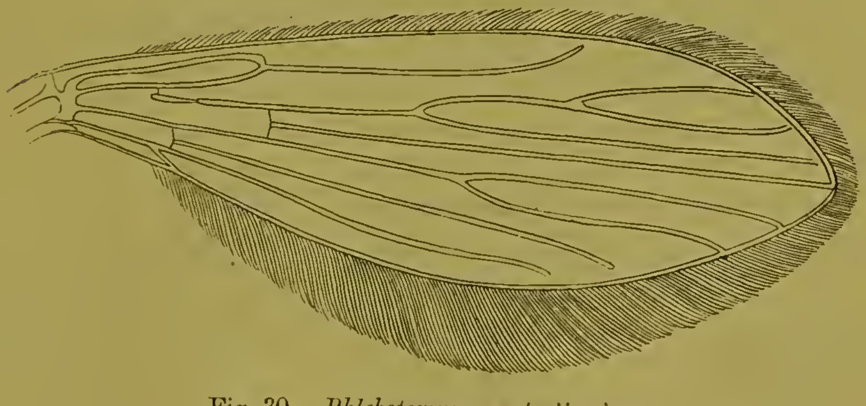

Fig. 30.—*Phlebotomus papatasii*, wing.

legs a little shorter than the middle pair, which are rather shorter than the hind pair; all covered with closely impressed small scales and scattered bristly hairs. Hind leg one and a half to one and three-quarter times as long as the thorax and abdomen;

hind femur about two-thirds as long as its tibia, which is nearly twice the metatarsus, the latter being very nearly as long as the rest of the tarsus; claws very minute. *Wings* elongate, rather narrow, bluntly lanceolate at tip; 1st longitudinal vein ending at about two-thirds of the wing; 2nd longitudinal forking almost exactly at the middle, immediately above or barely proximad of the fork of the 4th; the upper branch of the 2nd forks before half its length; a very short 7th vein is distinctly present towards the base of the 6th, running to the wing-margin. Halteres normal.

Apparently generally distributed throughout South Europe and Egypt. From India it is recorded from the plains of Rawalpindi;

Fig. 31.—*Phlebotomus papatasii*; *a*, pupa: *b*, full-grown larva.

Chitral, 6000 ft.; Quetta; from Pusa, North Bengal, common in April; and from Poona and Kirkee, near Bombay, August 1907; Lahore. In the Indian Museum and Pusa collections.

Type. The whereabouts of this seems uncertain.

Newstead found two distinct forms of this species in Malta—a uniformly pale form, which he regards as typical, and a darker form which differs by having a dark coloured fringe to the costa and hind margin of the wing. Of this dark form he has only seen the female and it is much rarer than the other.

150. Phlebotomus malabaricus, *Ann.*

Phlebotomus malabaricus, Annandale, Rec. Ind. Mus. iv, p. 48 (1910).

♂ ♀. Body with brown bristly hairs which are tinged with purple and the usual silvery lights; wings purplish, strongly iridescent.

Head: rostrum short, rounded in front. The 2nd scapal joint pear-shaped, with several circles of hairs and scales: 1st flagellar joint much longer than the second. Palpi long, 5-jointed; 1st very short, 2nd shorter than 3rd or 4th, 3rd and 4th subequal, together shorter than the 5th. *Thorax* with dense upright curved brown bristly hairs. *Abdomen*: ground-colour dark brown, with

bristly pale grey recumbent hairs, which are more yellowish towards the tip of the abdomen. Genitalia of male with the upper appendages having the distal joint less than half as long as the proximal one, bearing four chætæ, each as long as the joint: one pair is situated at the tip of the appendage and the other a short distance nearer the base of the joint; intermediate appendages without a ventral branch; the dorsal branch resembling that of *P. perturbans*; lower appendages slender, cylindrical, slightly shorter than the basal joint of the upper pair, bearing at the tip (in addition to a bunch of fine bristles) seven minute, conical chitinous spines. Intromittent organ long and slender; the apices of the valves club-shaped; genital filaments well developed. The female genital organs much as in *P. perturbans*. *Legs* with concolorous pubescence; coxæ and trochanters pale brown; the basal part of the femora distinctly lighter than the apical, the contrast apparently more marked in the female, though, owing to paucity of material, this may be individual variation only. Hind leg one and a half times as long as thorax and abdomen together; the femur nearly three-quarters the length of the tibia, and once and two-thirds that of the metatarsus, which is three-quarters that of the remaining joints together. *Wings* pointed; 1st longitudinal vein ending at three-fourths of the wing; fork of 2nd vein slightly before that of 4th vein, both distinctly before middle of wing; petiole of 1st submarginal cell very short.

Length 2½ millim.

Travancore, S. India, below the western slopes of the Western Ghats, in jungle, numerous specimens being taken "at light" by Dr. Annandale, at Nedumangad, Pallode, and Maddathorai, in November 1908.

Types in the Indian Museum.

Very near *P. perturbans*; distinguished by a different venation, shorter legs, and better developed chætæ in the male genitalia.

151. **Phlebotomus zeylanicus**, *Ann.* (Pl. IV, fig. 14.)

Phlebotomus zeylanicus, Annandale, Spol. Zeyl. vii, p. 60, figs. 4 & 5 (1910).

♂ ♀. Body uniformly brown, with concolorous bristly hairs, paler in the female than in the male; coxæ yellowish, remainder of legs silvery grey. Wings pale brownish grey.

Abdomen: the genitalia of the male with the "distal joint of the upper appendages slightly shorter, and much more slender than the proximal joint; its outlines are somewhat sinuous, and it bears five long, stout, curved, sharp chætæ, which are arranged as follows:—a pair at the tip of the appendage, a pair on the outer margin at about half the length of the joint, and a single chæta on the inner margin nearer the base. The chætæ are equal or subequal. The intermediate appendage (morphologically the lower branch of the upper one) is slender, pointed, and turned upwards at the tip. It bears a minute, pointed, naked lobe on its ventral surface, and a similar one on its external lateral

surface. The lower appendage is much longer than the proximal joint of the upper one, it is slender, as viewed from the side, and of almost uniform width; the tip is narrowly obliquely truncate, and bears a brush of very long and slender hairs; the rest of the appendage is sparsely covered with rather shorter hairs, but there are no spines" (*Annandale*). *Legs*: coxæ and femora yellowish, femora, tibiæ, and tarsi with silvery grey reflections. Hind leg more than two and a half times as long as thorax and abdomen; hind femur less than three-quarters, but more than half as long as

Fig. 32.—*Phlebotomus zeylanicus*, Ann.

its tibia, slightly longer than the metatarsus, which is distinctly shorter than the remaining joints together. *Wings* shortly lanceolate. The 1st longitudinal vein ends at three-fourths of the wing; the 2nd vein forks at or immediately beyond one-third, opposite or barely beyond the fork of the 4th vein; the anterior branch of the 2nd vein forking at one-fourth of its length.

Length 3 millim.

Several specimens of both sexes taken at Peradeniya, Ceylon, in May, June, July, and August.

Types, ♂ and ♀, in the Indian Museum.

This species and *P. malabaricus* are differentiated somewhat easily from all the others by the 2nd longitudinal vein forking at approximately one-third the length of the wing. The genitalia very closely resemble those of *P. argentipes*.

Subfamily PSYCHODINÆ.

The chief distinctive features of this subfamily are (1) the presence of a 7th longitudinal vein of considerable length, always as conspicuous as the 6th, and (2) the forking of the 2nd longitudinal vein quite near the base of the wing instead of at or beyond the middle, as in the PHLEBOTOMINÆ. The upper branch of the 2nd longitudinal vein forks again as usual in this family, but this second forking always occurs *before* the middle of the wing.

The secondary characters are the structure of the male genital organs, consisting of two (*Psychoda* and *Pericoma*) or three (*Brunettia* and *Parabrunettia*) pairs of appendages. The ovipositor of the female consists of a conspicuous horny scimitar-shaped projecting appendage, forming a pair of valves.

Table of Genera.

1. The 3rd longitudinal vein ending exactly at the wing-tip	2.
The 3rd longitudinal vein ending just *below* the wing-tip	3.
2. Membrane of wing never considerably covered with scales, these being confined to those forming the small wing-spots. Flagellar joints of antennæ without conspicuous S-shaped chætæ. Male genitalia with two pairs of appendages	PSYCHODA, Latr., p. 218.
Membrane of wing with considerable areas covered with scales. Flagellar joints of antennæ with distinct, fairly conspicuous S-shaped chætæ.* Male genitalia with three pairs of appendages	PARABRUNETTIA, Brun., [p. 251.
3. Anterior basal angle of wing not abnormally extended; auxiliary and 1st longitudinal veins in their usual position. Membrane of wing without scales. Flagellar joints of antennæ with the S-shaped chætæ inconspicuous or absent. Male genitalia with two pairs of appendages .	PERICOMA, Walk., p. 234.
Anterior basal angle of wing very disproportionately rounded and distended, so that the auxiliary and 1st longitudinal veins are very much removed from the costal margin. Membrane of wing closely and wholly covered with overlapping scales. Flagellar joint of antennæ with conspicuous S-shaped chætæ. Male genitalia with three pairs of appendages.	BRUNETTIA, Ann., p. 248.

* I do not know that these have been observed in every species, but it seems probable that they are generally, if not always, present, as there appears to be a correlation between these organs and the densely sealed wings.

A closer study of the Indian species of *Psychoda* and *Pericoma* has resulted in several characters being found which were not made use of in my first paper on this family.

Firstly, there is the presence or absence of distinct scales on the wings—nearly always of some shade of brown, although sometimes appearing whitish or greyish when viewed from certain directions. These scales appear in only one species (*apicalis*) of *Psychoda*, whilst in *Parabrunettia* they are present in some species on both the upper and lower surfaces of the wing, and in others on the lower surface only. In referring to these scales, allusion is not made to a certain number of scale-like hairs or even true scales, few in number and irregularly placed, at the base of the wing, and which may be present in many species, possibly adventitiously; but only to cases where the scales are numerous, eminently conspicuous and arranged in regular rows, covering thickly the whole of such portion of the wing-surface as they may occupy.

The second character, which, like that of the scales, is quite consistent in its occurrence or absence, is that of the hairs, comparatively soft or at least less bristly than usual, closely covering the membrane of the wing as well as the veins and arranged *longitudinally* or nearly so, so that they do not form the "criss-cross" pattern as in the case of all those species in which the hairs are confined to the veins. It is quite obvious at a glance to which category any wing belongs except in the densely scaled ones.

The third consistent character is the position at which the 2nd longitudinal vein forks (always near the base of the wing); whether before or after the origin of the 3rd longitudinal vein.

Further characters appear less definite and should best be applied only to the separation of closely-allied species, being liable to occasional variation. The three principal characters above specified can be used in both *Psychoda* and *Pericoma*.*

Genus **PSYCHODA**, *Latr.*

Psychoda, Latreille, Précis gen. Ins. p. 152 (1796).
Phalænula, Meigen, Nouv. class. Mouches (1800).
Trichoptera, Meigen, Illig. Mag. ii, p. 261 (1803).
Tinearia, Schellenberg, Gen. des Mouches (1803).

GENOTYPE, *Tipula phalænoides*, L.

Head small, rounded, much arched, much developed posteriorly, narrower than the thorax and placed very low down on the latter. Frons equally broad in both sexes; eyes kidney-shaped. Ocelli absent. Proboscis short. Palpi 4-jointed, moderately long and prominent, the joints not greatly differing from one another in length. Antennæ moderately prominent, somewhat long, 15- or

* Probably they will be found to apply equally well to at least *Parabrunettia* also, when this genus is more closely characterised and its species better understood.

16-jointed;* the two basal or scapal joints differentiated, short and broad; the flagellar joints varying in shape according to the species, usually oval, cylindrical or flask-like, each with a quantity of verticillate hairs forming a cup- or basin-like corolla. All the organs of the head difficult of observation without dissection owing to the dense pubescence of the whole head, except the eyes. *Thorax* robust, considerably arched, barely longer than broad; surface smooth, but densely covered on all sides with thick long bristly hairs. Scutellum very small, wholly inconspicuous, metanotum arched, both covered with dense pubescence. *Abdomen* short, broad and thick, barely longer than the thorax; arched, equally densely pubescent as the thorax, with similar thick bristly hairs; segments somewhat compressed. The male genitalia consist of two pairs of appendages, the lower pair being united to a ventral plate, which latter really represents the ultimate abdominal segment. Viewed from the side, this plate, which is always very conspicuous, appears like the basal joint of the lower appendages, but these latter consist of only a single joint, usually of considerable size, elongate-conical, slightly curved, pointing upwards, bearing at the tip at least one chitinous spinule. The upper appendages are smaller than the lower pair, two-jointed, the basal joint being the shorter, the second one tapering to a point, but without a spinule. No chitinous intromittent organ apparent, according to most authors, but Mr. Leonard Haseman, writing on the North American species, mentions having observed it in one or two species. In the female the genital apparatus consists of a horny, upwardly curved, pointed ovipositor, constructed of two laterally compressed valves closely applied to one another. *Legs* short, robust, subcylindrical; tibiæ generally rather longer than the femora, metatarsus much longer than any other tarsal joint, last tarsal joint small. Legs generally covered with small scales, with some long bristly hairs on the femora and tibiæ; tibiæ and tarsi often with an apical circlet or band of scales of a different colour (white or yellowish). *Wings* very broad and comparatively very large, although in some species narrower, even lanceolate; always covered thickly with hairs, which may cover the wing-membrane as well as the veins (in which case the hairs are generally of a rather finer texture). In other species the hairs are confined to the veins, and are more bristly in nature, often scale-like, and always arranged in two divaricate depressed rows, lying practically flat on the wing-surface, the hairs being of sufficient length to lie across those of the two immediately adjacent veins.† Erect, long,

* Some authors, Mr. Leonard Haseman for instance, speak of some species having 17-jointed antennæ; but it is probable that the so-called seventeenth joint is only formed by the constriction of the sixteenth.

† No previous author appears to have noticed this radical difference in the distribution of the hairs on the wings, yet though I overlooked its importance in my first notes on this family, a more serious examination of the species resolved them easily into two groups on this character alone. The species of *Pericoma* are amenable to the same division.

bristly or scale-like hairs in small groups or arcs on many of the veins in many species. There are often small spots composed of bristly or scale-like hairs, or of actual scales, occurring in various parts of the wing, most frequently on or near the wing-border, generally situated at the tips of the veins, or at the forking of the veins. Flat, short, depressed, imbricating scales, cover parts of the surface of the wing in some species; rarely the whole surface thus covered. Auxiliary vein short. 1st longitudinal vein ending in the costa, generally beyond the middle of the wing; 2nd longitudinal forked near its base, the anterior branch again forked, usually in the middle third of the wing. The 3rd vein arises near the base of the 2nd, either before or beyond the forking of that vein, and runs straight to the wing-tip. The 4th longitudinal is forked, generally a little before or beyond the fork of the anterior branch of the 2nd vein; the 5th, 6th and 7th longitudinal veins normal, straight or gently curved. The anterior cross-vein is always present, but is often difficult to observe owing to its faintness in most of the species: it is placed almost immediately after the base of the 3rd longitudinal vein. Sometimes a distinct posterior cross-vein near the bases of the 4th and 5th veins is discernible, the vein is therefore presumably always present. A thick, long, uninterrupted fringe around the whole wing-border, much more bristly or scale-like on the costa, and often punctuated on both anterior and posterior margins by small spots of snow-white or prismatic scales. Alulæ practically absent; squamæ (or tegulæ) moderately developed or small; halteres distinct.

Range. Probably world-wide, though no species are recorded from Africa (except the Mediterranean Coast), Asia (except India) and Australasia.

Life-history. The perfect insects are commonly found in moist situations, near streams, small drains or water-courses, in out-houses and closets, very frequently on windows and in houses, also generally distributed amongst low-growing vegetation.

Table of Species.

1. Membrane of wing wholly covered with closely placed imbricating scales ...... *apicalis*, Brun., p. 223.
   Membrane of wing either without scales, or, when present, the scales limited to a few small tufts forming spots placed at the tips of the veins; on the margin of the wing; or at the forking of the veins; never covering any appreciable extent of the wing-surface.* Sometimes a few, irregularly placed, at the base of the wings .... 2.

* An apparent exception is *P. orbicularis*, Brun., in which scales are present on the basal portion of the *veins only*, but never on the membrane of the wing, that is to say, *emanating* from the membrane.

2. Wing with the membrane closely covered with hairs, as well as the veins, the hairs placed much more longitudinally than in the species of section 7, giving a longitudinal appearance to the wing-vestiture instead of a "criss-cross" network one . . 3.
Wing with the hairs on the *veins only*, arranged in two divaricate depressed rows, one on each side, and nearly always overlapping those of the contiguous veins, presenting a "criss-cross" appearance over the whole wing. No hairs whatever on the surface of the wings. No obvious scales, except those forming the small spots . . . . 7.

3. Distinct spots at least near the margin of the wing, white or black or both, composed of small scales or stiff hairs . . . . . . 4.
No distinct spots at or near the wing-margin. With or without two transverse narrow bands of grey scale-like hairs . . 6.

4. The white spots on the wing chiefly confined to the border, or the forking of the 2nd and 4th longitudinal veins . . . . 5.
The white spots (20 or more) distributed irregularly along all the veins, giving the entire wing a spotted appearance . . . . . . *maculipennis*, Brun., p. 223.

5 (*a*). Anterior branch of 2nd longitudinal vein forks opposite fork of the 4th vein. A few scales near the base of the wing. The small white scaly hair-spots placed at the tip of each vein, wherever they occur . . . . *albonotata*, Brun., [p. 224.
(*b*). Anterior branch of 2nd longitudinal vein forks a little before the fork of the 4th vein. The white spots composed of white *hairs*, not scales, and placed between the tips of the veins, not at the tips . . . . *distincta*, Brun., p. 225.
(*c*). Anterior branch of 2nd longitudinal vein forks near middle of wing, a little beyond the fork of the 4th vein. All three terminations of the 2nd and that of the 3rd vein with a pair of small spots placed very closely together, composed of a few elongate yellow bristly hairs. Lower branch of 4th vein, and the 5th vein, at their tips with conspicuous black hair-spots . . . . *decora*, Brun., p. 226.

6. Wing with two transverse bands of grey scale-like hairs . . . . *transversa*, Brun., [p. 226.
Wing wholly unmarked . . . . *hirtipennis*, Brun., [p. 227.

7. Wing with distinct black hair-spots at the tips of many or all of the veins . . . . 8.
Wing without hair-spots at tips of veins . . . . 12.

8. The 2nd longitudinal vein forks very closely before or beyond the base of the 3rd vein .... 9.
The 2nd longitudinal vein forks considerably beyond the base of the 3rd vein .... 11.
9. Fore metatarsus wholly white-scaled .... *geniculata*, Brun., [p. 227.
Fore metatarsus never wholly white-scaled (at the tip only in *P. albonigra* and not at all in *P. bengalensis*) .... 10.
10. Wings with thick black bushy hair on costa, with small spots (each composed of one or two white scales) placed along a considerable section of it, at apparently regular intervals. The 2nd longitudinal vein forks immediately before the base of the 3rd vein; the fork of the anterior branch of the 2nd vein opposite that of the 4th vein .... *albonigra*, Brun., p. 228.
Wings with only normally blackish grey hair; scale-spots wholly absent. The 2nd longitudinal vein forks barely beyond the base of the 3rd vein; the fork of the anterior branch of the 2nd vein a little beyond that of the 4th vein............ *bengalensis*, Brun., [p. 229.
11. White scale-spots absent from tips of veins. Tips of tibiæ and metatarsi not white-scaled .... *distans*, Brun., p. 230.
White scale-spots present at tips of veins. Tips of tibiæ and metatarsi with white scales .... *albopicta*, Brun., p. 231.
12. Veins of wings wholly without rows or spots of distinct scales .... 13.
Veins of wings with distinct scales on the basal fourth of all of them .... *orbicularis*, Brun., [p. 231.
13. The 2nd longitudinal vein forks beyond the base of the 3rd vein. Hairs on veins uniformly blackish — no conspicuous lighter sections of hairs. The middle veins (2nd, 3rd and 4th) nearly straight or gently bisinuate .... 14.
The 2nd longitudinal vein forks before the base of the 3rd vein. Hairs on veins mainly blackish, but with a transverse band of light brown hairs, formed by a short row placed beyond the middle part of each vein, in the distal portion of the wing. The middle veins (2nd, 3rd, 4th) distinctly arcuate .... *vittata*, Brun., p. 233.
14. Thorax with blackish grey hairs. Anterior branch of 2nd longitudinal vein forking a little beyond the middle of the wing, the 4th forking a little before the middle .. *nigripennis*, Brun., [p. 232.
Thorax with bright yellowish brown hairs. Anterior branch of 2nd vein forks as in *P. nigripennis*, but the 4th vein forks near base of wing .... *fulvohirta*, Brun., [p. 233.

152. **Psychoda apicalis**, *Brun.*

Psychoda apicalis, Brunetti, Rec. Ind. Mus. iv, p. 301 (1911).

? ♀. Body with dark brown hairs on the thorax, a little lighter here and there. The abdomen (subsequently lost) seems to have been covered with small elongate whitish scales which, when viewed in certain lights, show prismatic colours.

Head: antennæ as in *P. nigripennis*, the pubescence very dense, lying rather close, so that the outline of the flagellum appears to have parallel sides. *Legs* closely covered with blackish scales; tips of tibiæ and of metatarsi with a row of white scales, of which there are a few on the tarsi. *Wings* very lanceolate and narrow, wholly covered with closely-placed, overlapping, dark brown scales. It is difficult to see whether hairs are present on the actual surface of the wing or not, but apparently (and in all probability) they are present; some are present on the veins. The 2nd longitudinal vein forks considerably beyond the base of the 3rd vein; the anterior branch forking again distinctly beyond the middle of the wing, a good distance beyond the fork of the 4th vein, which occurs just before the middle of the wing. Wing-border wholly unmarked, bearing a blackish-brown fringe, darkest on the costa and at the base of the hind margin; a small arc of nearly snow-white hairs at the tip of the wing.

Length of wing 2 millim.

Described from a single female (?) in the Indian Museum from Maddathorai, Travancore State, South India, 16. xi. 08 (*Dr. Annandale*).

Very distinct from all other species owing to the densely scaled wings, with snow-white fringe at the tip. The abdomen has been lost in mounting the specimen for the microscope, after the description was drawn up, but the length of the insect was overlooked. It is a small species, the wing measuring 2 millim. in length. The sex is not quite certain, but was noted originally as "probably female."

153. **Psychoda maculipennis**, *Brun.*

Psychoda maculipennis, Brunetti, Rec. Ind. Mus. iv, p. 299 (1911).

? ♂. Body with rich dark brown hairs towards sides of dorsum, yellowish grey in middle and anteriorly, deep blackish brown on abdomen.

Head: antennæ with verticillate hairs thick and close, brownish, but showing greyish reflection. Palpi black, with grey scales; grey scales on face, black bristly hair on frons; grey hair on vertex. *Legs* brownish, with concolorous bristly hair and scales; tarsi with dirty grey scales. *Wings* with surface as well as veins closely covered with dark brown hairs. Wing-border with a narrow fringe of black hairs, which is tolerably well defined from the longer greyish fringe around the whole margin. At numerous and apparently irregular intervals these short black hairs are

replaced by white or greyish ones, and irregularly placed along most of the veins, as well as at the tips, are very small spots composed of a few white hairs, which (to the extent of twenty or more) give the whole wing a spotted appearance that immediately distinguishes it from all other species.

Length 1 millim.

Described from a single specimen, apparently a male, in good condition, from Peradeniya, Ceylon, 17. vi. 10 (*E. E. Green*).

Type in the Indian Museum.

154. **Psychoda albonotata**, *Brun.*

Psychoda albonotata, Brunetti, Rec. Ind. Mus. ii, p. 373 (1908).

♀. Ground-colour black; thorax and abdomen with whitish grey hairs which, in certain lights, appear silvery.

Head: eyes black, facets large; interocular space light brown, filled with strong, rather long black bristles. Antennæ sixteen-jointed, light brown; two basal joints cup-shaped, rather short, with circlets of stiff black bristles; the flagellum of fourteen cup-shaped joints, placed rather closely together, and bearing the usual hairs which are both thick and long. Palpi dark brown, hairy. *Abdomen*: the genital apparatus appears to be a moderate-sized, bare, pointed, pale yellowish brown appendage, similar to that of this sex in other species. *Legs* with livid yellow femora and tibiæ, the latter black towards the tips; tarsi brownish black, covered with close brownish scales. The extreme tip of the tibiæ, of the metatarsus, and of the last tarsal joint with a few brilliant snow-white hairs. *Wings* with the upper prong of the 2nd longitudinal vein originating much before the fourth part of the total length of the wing; the 4th longitudinal vein bifurcates at about one-fourth of the wing. Ground-colour dark grey, the veins with the usual double row of hairs, which are black, giving, with the long fringe of black hairs around the whole wing-border, a wholly black appearance to the wing, the surface of which is covered with hairs placed longitudinally. Some distinct shortly elongate dark brown scales over the base of the wing. A silvery white spot formed by a few minute, very elongate, hair-like white scales, at the tip of all the veins, from the first to the sixth inclusive, nine spots altogether.

Length 1 millim.

Described from a female, in excellent condition, in the Indian Museum collection, taken in Calcutta, 5-6. i. 08.

The general appearance of this species is that of a black *Psychoda* with nine snow-white spots on the wing-border and with white spots on the legs. In certain lights nearly all parts of the body in turn appear more or less silvery white, including the black wing-fringe, the femora and tibiæ, and nearly the whole of the pubescence on the body; the wings also, in certain lights, present a beautiful iridescence.

A second example in the same collection, from Sylhet (*Lt.-Col.*

Hall), 8. i. 05, is apparently the same species. The hairs on the wing are golden brown, and those on the body more brownish than in the Calcutta specimen, whilst the white scales cover the whole of the metatarsus. The antennæ are missing, and there are a few white, elongated, hair-like scales in the centre of the wing towards the base. The wing-fringe is golden brown on the distal half and black on the basal part of the costa and on most of the posterior margin.

In a note appended to the original description is mentioned a specimen from Sylhet with a few remaining white scales on the surface of the abdomen near the base, but closer investigation reveals that they must have become accidentally attached, forming no part at all of the insect's vestiture.

155. **Psychoda distincta**, *Brun.* (Pl. IV, figs. 12, 13.)

Psychoda distincta, Brunetti, Rec. Ind. Mus. ii, p. 372 (1908).

♀. Body pale brownish yellow, entirely clothed with long, pale brownish yellow, bristly hairs, with some concolorous elongated scales, and with a few black bristles here and there. The bristles are long, and become scale-like on the dorsum of the thorax and towards the tip of the abdomen, where, in the latter case, the black bristles are also more numerous.

Head: eyes black, with dense, soft, pale yellowish grey hairs between them. Antennæ sixteen-jointed; first joint of scape cylindrical, second spherical; flagellum of fourteen elongated, pear-shaped joints, each surrounded by numerous long hairs in the form of a rather irregular verticel. *Legs* with numerous bristles, which are very long on the tibiæ, which, in addition, have short scales of the same colour lying rather close, and a circlet of rather long, scale-like bristles at the tips. The metatarsus, which is nearly as long as the four remaining subequal joints together, has a few irregular bristles, and the tarsi are covered by close-lying, pale yellowish white scales, giving a whitish appearance in certain lights. *Wings*: the upper prong of the 2nd longitudinal vein forks near the base, before one-third of the wing, and the 4th longitudinal vein forks at exactly one-third. All the veins seem to bear the usual double row of hairs, and the intervening spaces are also covered with brown hairs rather thickly; there is a patch of black hairs at the tip of all the veins from the 1st to the lower fork of the 4th (inclusive), with a trace of a patch at the tip of the 5th; and a patch of white hairs appears between all these black patches, so that the border of the wing appears spotted alternately black and white, and is fringed along its entire length with close, long, light brown hairs. The hairs of the wing appear lighter or darker in different specimens, according to the direction in which the light falls on them, a brilliant iridescence being at times visible.

Length 1½ millim.

Type in the Indian Museum, from Sylhet, 30. i. 05 (*Hall*); the second specimen was from the same locality.

Described originally from three specimens supposed to represent this species; but the one mounted on a microscopic slide, which bore the scales at the base of the wing, was afterwards found not to be *P. distincta.*

In the type-specimen (the only one now existing, as the one dated 1. i. 05 has been accidentally destroyed) there is absolutely no trace of any such scales, either at the base of the wing or elsewhere on it, with the exception of the very small ones that compose the wing-margin spots.

156. **Psychoda decora**, *Brun.*

Psychoda decora, Brunetti, Rec. Ind. Mus. iv, p. 299 (1911).

♀. Body covered with blackish hairs, the thorax covered with bright yellowish brown hairs.

Head: antennæ with the pubescence rather closely compressed, as in *P. nigripennis*. *Legs* brown, normally scaled and pubescent. *Wings* with dark brown and blackish hairs covering the surface as well as the veins. Two inconspicuous and incomplete narrow transverse lines passing across the wing similar in position to those in *P. transversa*, composed of light brown or yellowish brown hairs, placed in small sections. Two distinct black spots near the base of the wing, composed of stiff erect long black thickened hairs, one spot on the base of the 2nd vein just before the fork, and the other on the anterior branch just beyond the fork. The wing-fringe is greyish, with blacker sections here and there; the hairs are also darker along the costa.

Length 1 millim.

Described from one female in the Indian Museum taken by Dr. Annandale at Tenmalai, Travancore State, South India, 22. xi. 08.

157. **Psychoda transversa**, *Brun.*

Psychoda transversa, Brunetti, Rec. Ind. Mus. iv, p. 300 (1911).

? ♀. Body covered with brownish grey or brownish yellow bristly hairs.

Head with the antennæ as in *P. nigripennis*. *Legs* blackish, with the tarsi showing a lighter shade in certain lights, the tips of the joints with small pale scales. *Wings* densely covered with blackish hairs situated over the entire surface as well as on the veins. No hair-spots or scale-spots at the tips of any of the veins, but two narrow transverse bands composed of elongated, thickened (almost scale-like) greyish white hairs, the first placed just before the middle of the wing, the second just beyond three-fourths of the wing; both bands extending from the costa to the hind margin.

Length 1 millim.

Described from a single specimen, which is apparently a female (the genital organ not being clearly visible), in the Indian Museum, from Kurseong, 4700–5000 feet, 20. vi. 10 (*Dr. Annandale*).

The two conspicuous transverse bands of grey stiff hairs on the wings immediately distinguish this species from all other Oriental ones.

158. **Psychoda hirtipennis**, *Brun.*

Psychoda hirtipennis, Brunetti, Rec. Ind. Mus. iv, p. 300 (1911).

♀. Body brownish yellow, with yellowish brown or brownish grey hair varying both in shade and intensity.

Head with the antennæ practically as in *P. nigripennis*. *Legs* with light brown scales, tarsi not obviously lighter, except when viewed in certain directions. *Wings* lanceolate, the brown hairs covering the surface and placed mainly longitudinally; no regularly divaricate rows of hairs on the veins. Some erect bristly hairs on the basal fourth of the wing.

Length about $1\frac{1}{3}$ millim.

Described from several specimens in the Indian Museum presenting the following data: Kurseong, 5. ix. 09 (*type*), Bangalore, 15. x. 10, Maddathorai, 18. xi. 08, Trivandrum, 12–13. xi. 08 (*Dr. Annandale*); Calcutta, 27. xi. 10.

One example of the above series (from Maddathorai) varies more than the others by having browner legs, brighter brown hair on the thorax, and a tendency to patches of darker hairs on the wing, with light greyish reflections here and there. The specimen seems to come within the probable specific range of *P. hirtipennis*, which is certainly of variable nature.

159. **Psychoda geniculata**, *Brun.*

Psychoda geniculata, Brunetti, Rec. Ind. Mus. iv, p. 294 (1911).

Very near *P. albonigra*, mihi.

♀. A dark brown species with dark brown wings and conspicuous white spots on the legs. Wings with black and white spots near tips of veins. Body clothed with thick blackish brown hairs, with which are intermixed on the thorax some fan-shaped tufts of whitish grey hairs.

Head with white bristly, almost scale-like hairs on vertex, and bristly black hairs on frons and face. Antennæ with very elongate flask-shaped joints, verticillate as in *P. bengalensis*; scape with milk-white elongate scales; chætæ present on flagellum, but small, curved, not S-shaped; pubescence of flagellum greyish white. *Legs* with light brown scales and some bristly hairs; knees narrowly but distinctly white, through the presence of a few snow-white small elongate scales; tips of tibiæ and of the metatarsi with a circlet of small elongate snow-white scales; front metatarsi almost wholly white-scaled. Some pale stiff bristles on the

legs, but apparently no actual isolated elongate scales as in *P. albonigra.* *Wings* with hairs situated on the veins only, rich brown in colour, showing golden brown with violet iridescence in certain lights. No surface-scales on the wings, the only ones present being the small ones forming the spots at the tips of the veins; black bristly hair-spots at tips of practically all the veins; some white scaly hair-spots near tips of some of the veins, and a few on each of the two lower branches of the 2nd longitudinal vein and both branches of the 4th vein, all placed at a little before their tips; a larger white scaly hair-spot near the base of the costa, and some isolated erect white hairs placed irregularly here and there on the veins. The 2nd longitudinal vein forks immediately beyond the base of the 3rd vein, the upper branch of the former forking barely beyond the middle of the wing, and very little beyond the fork of the 4th vein.

Length about $1\frac{1}{2}$ millim.

Described from one female in the Indian Museum from Peradeniya, Ceylon, October 1910 (*E. E. Green*).

160. **Psychoda albonigra**, *Brun.*

Psychoda albonigra, Brunetti, Rec. Ind. Mus. ii, p. 374 (1908).

♀ (?). *Head*: frons and face with white bristly hairs on upper part and black scaly bristles below. Antennæ with second joint of scape short, cup-shaped, both joints encircled by white scales; flagellum of fourteen distinct, pale yellow, flask-shaped joints, and an additional very minute spherical one; each joint bearing a thick verticel of stiff greyish white hair. Palpi black, with black bristly hairs. *Thorax* covered with thick, bristly, greyish white hairs, with some darker hairs intermixed. *Abdomen* (damaged) dirty yellow, with some black hairs. *Legs*: femora pale dirty yellow; knees with a very few small white scales; tibiæ with closely placed black scales, with black bristles intermixed, and bearing irregular, isolated, white scales and white bristles; the posterior pairs with rather long black hairs behind; tips of tibiæ with a few white scales. Tarsi covered with black scales and a few bristles; the tips of the metatarsi with a circlet of white scales, and of the last joint with a few white scales. *Wings* very pale grey, nearly clear round the posterior border. The veins with the usual double row of blackish grey hairs, with some white, nearly erect hairs placed in irregular rows and patches about the middle of and (more abundantly) across the base of the wing; a small bunch of black bristly hairs at the tip of each vein, and the costal border clothed nearly to the tip of the wing with stiff, black, bristly hairs; along this border, at short regular intervals, one or two small white scales; towards the tip of the costa the wing-fringe becomes greyish, and from thence, round the border, nearly to the base, it is greyish white, rather long and thick; near the base of the posterior margin the fringe becomes blackish grey.

The bifurcations of the upper branch of the second vein, and of the fourth vein, occur just before the middle of the wing.

Length nearly 1 millim.

Described from a perfect unique female (?) in the Indian Museum collection, captured by Dr. Annandale in the Museum, 30. vii. 08.

The type still remains the only known specimen.

161. **Psychoda bengalensis**, *Brun.* (Pl. IV, figs. 6 & 8.)

Psychoda bengalensis, Brunetti, Rec. Ind. Mus. ii, p. 370 (1908).

♂ ♀. Body entirely clothed with hairs, varying from yellowish grey to whitish, and of a nature varying from soft long hairs to bristly ones, which latter on some parts, and around the tip of the abdomen, are distinctly scale-like; in certain lights some of the scale-like bristles appear blackish or even wholly black.

Head: eyes black, with very large facets; frontal groove very narrow, with long greyish hairs; lower part of head covered with long hairs. Antennæ fifteen-jointed; scape of two larger egg-shaped joints; the flagellum of ten joints of nearly uniform size, each shaped like a long-necked flask, and three further very minute joints, invisible except under a microscope. Each joint of the whole antenna bears a rather thick verticel of hairs. Palpi of four joints of equal length, with some hairs; last joint very thin, pointed. *Abdomen*: the genital process of the male with superior appendages consisting of two subequal joints, the proximal joint cylindrical, often concealed in a vertical position in the body, distal joint sickle-shaped, its ventral edge being somewhat sinuous. Inferior appendages very long, arising from an elongated, broad ventral plate; themselves sickle-shaped, clothed with long fine hairs at their base, and bearing very minute straight bristles on their ventral surface, each appendage terminating in a single, short, flattened, almost triangular spinule. The ovipositor of the female consists of a pair of very small, pointed, chitinous appendages, which it is somewhat difficult to distinguish amidst the hairs. *Legs* of the same colour as the body, clothed rather thickly with concolorous scales and with numerous black bristles, the former being thickest on the tibiæ and tarsi. *Wings* with all the veins bearing a double row of hairs, pointing respectively anteriorly and posteriorly.* The fork of the upper prong of the 2nd longitudinal vein originates a little before the middle line of the wing; and the fork of the 4th longitudinal vein originates a little behind this middle line, but the linear space between the two forks varies in different specimens. A few black bristly hairs, forming a small black spot, occur at the tip of each of

* In the figure of the wing of this species (Rec. Ind. Mus. ii, pl. xxiv, fig. 1) no auxiliary vein is shown, although it is, of course, distinctly present, extending at least to a point beyond the fork of the 2nd longitudinal vein.

the four veins *above* the 3rd longitudinal (which is unmarked); also at the tip of the upper prong of the 4th, and at the tips of the 5th and 7th. These black hairs gradually become more scale-like towards the last spot, which is usually the deepest of all.* The whole border of the wing is thickly fringed with long blackish grey hairs, which extend over the tegulæ also.

Length 1–1¾ millim.

Described from a very large number of examples in good condition in the Indian Museum collection, taken chiefly on windows, in Calcutta during January 1908, and in Simla and neighbouring places in May of the same year. Specimens are also present from Phagu, 9000 ft., 11. v. 09; Barogh, 5000 ft., 10. v. 10; Kasauli, 6300 ft., 15. v. 08; Dharampur, 5000 ft., 13. v. 08, all in the Simla hills (*Dr. Annandale*). Naini Tal, 6000–7000 ft. (*Lloyd*). Darjiling, 5000 ft., apparently common from at least July to October; Kurseong, 24. iii. 10 (*Annandale*). Calcutta, common through most of the year; Port Canning, Ganges Delta, 6. xii. 07 (*Annandale*); Katihar, Purneah district, Oct.; Lucknow, i, ii and iv, Dum Dum, near Calcutta, 29. vii. 09 (*Lord*); Madhupur, 22. x. 09 (*Paiva*); Bangalore, 3000 ft., 16. x. 10 (*Annandale*); Trivandrum, 13. xi. 08 (*Annandale*); Kulatupuzha and western base of Western Ghats, Travancore, 17–19. xi. 08 (*Annandale*); Peradeniya, Ceylon, 8. vi. 10 (*Gravely*); Moulmein, 25. ii. 08 (*Annandale*); Rangoon, v.; Tenasserim, v. In the Pusa collection, from Pusa v. to xii. 1907 and 1908.

Types in the Indian Museum; co-types in my collection.

This is the commonest species in India and probably extends further east.

162. Psychoda distans, *Brun.*

Psychoda distans, Brunetti, Rec. Ind. Mus. iv, p. 296 (1911).

♀. Body covered with dark brown hair, mixed here and there with grey, the ground-colour of the thorax yellowish brown, with dark greyish hair.

Legs brown, the tarsi a little lighter, no white tips to tibiæ or metatarsi. *Wings* with the two divaricate rows of hairs on the veins only. The 2nd longitudinal vein forks considerably beyond the base of the 3rd; the anterior branch forking just beyond one-third of the wing, and nearly opposite the fork of the 4th vein. A distinct and rather large black bristly hair-spot at the tip of each vein; no white scale- or hair-spots on the wing; a distinct though not conspicuous spot, composed of black hairs, at the

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* In some specimens there is a collection of black hairs showing a tendency to form an irregularly shaped spot at the base of the wing, and, more often, two similar vague spots, one below the costa, the other above the hind border, both near the base of the wing.

fork of the 2nd longitudinal vein and at the fork of its anterior branch also.

Length barely 1 millim.

Described from a single female in the Indian Museum from Maddathorai, Travancore State, South India, 16. xi. 08 (*Dr. Annandale*).

The genital organs are not easily seen, but the specimen appears to be a female.

163. **Psychoda albopicta**, *Brun.*

Psychoda albopicta, Brunetti, Rec. Ind. Mus. iv, p. 296 (1911).

♀. Very near *P. distans*, but differing from that species by very distinct though small white scale-spots at the tips of most of the veins, including the 3rd vein. A conspicuous bunch of black scaly hairs at the fork of the anterior branch of the 2nd longitudinal vein and the fork of the 4th vein. Some of the black hair-spots at the tips of the veins are much less distinct than in *P. distans*. Fringe of wing dark brown on costa, lighter brown on posterior margin, the whole appearing golden brown in certain lights. The hairs on the wing are brown, darker towards the base. The body is dark, with brownish yellow hairs, which are darker brown on the thoracic dorsum, and almost yellow in places. Antennæ brown, flagellar joints flask-shaped with long necks, the verticillate hairs widely expanded. Long sinuous chætæ distinctly present. The tips of the tibiæ and of the metatarsi with a narrow circlet of white scales; the legs moderately dark brown.

Length $1\frac{3}{4}$ millim.

Described from a single type female in the Pusa collection, taken at Pusa, Bengal, 8. i. 08.

164. **Psychoda orbicularis**, *Brun.*

Psychoda orbicularis, Brunetti, Rec. Ind. Mus. iv, p. 298 (1911).

♀. Very near *P. nigripennis*, but differing by the presence of distinct elongate brown scales on the basal fourth of all the veins. The wing is lanceolate in shape, the entire margin very distinct, the costal fringe blackish, but appearing lighter if viewed from certain directions; the fringe of the posterior margin light greyish. The 2nd longitudinal vein forks distinctly beyond the base of the 3rd vein, the anterior branch forking immediately before the middle; the 4th vein forks distinctly before one-third of the wing. The body is covered with brown or brownish-grey hair. The antennæ as in *P. nigripennis*, with grey pubescence. The legs yellowish grey, with light greyish pubescence.

Length $\frac{3}{4}$ millim.

Described from a single female in good condition from Pusa, 21. xii. 08. In the Pusa collection.

165. **Psychoda nigripennis**, *Brun.* (Pl. IV, fig. 16.)

Psychoda nigripennis, Brunetti, Rec. Ind. Mus. ii, p. 376 (1908).

♂ ♀. Body yellow, wholly covered with greyish brown hairs, which in certain lights appear whitish.

Head: eyes jet-black, facets very large. Antennæ: basal joints short and not broader than the flagellum, yellow, with some black bristles; second joint spherical; flagellum of fourteen joints, of which the first ten are flask-shaped (as in *P. bengalensis*); the eleventh has no "neck," and is roughly ovate; the twelfth, thirteenth and fourteenth are very minute, the two former cup-shaped, the terminal joint spherical. The verticels of greyish-white hairs on each joint are very thick, lying closely, directed forwards and clustering together, thus giving the antenna the usual solid appearance, with parallel sides, of a grey colour, marked with small black round spots. Palpi of four hairy elongated cylindrical joints, of equal length, except that the fourth is slightly longer and pointed at the tip. *Abdomen*: genitalia of the male very similar to those of *P. bengalensis*, but the inferior appendages decidedly shorter. In the female they consist of a very concave (on the upper side) leaf-shaped appendage, bending backwards, but the appendage probably consists of two symmetrical blade-like halves as in the other species. *Legs* pale blackish brown; the femora with some white hairs below, the tibiæ rather closely covered with snow-white hairs, the tarsi blacker, with white hairs which, towards the tip, are replaced by small elongated white scales. *Wings* having the appearance of being pale blackish, but really pale grey, wholly unmarked; the veins distinct, each with the usual double row of hairs, which appear black when viewed from above, but which appear white when viewed horizontally from the tip of the wing. Fringe longest on posterior border, grey, appearing dark in some lights and nearly white in others. Wings with a purplish iridescence.

Length $\frac{2}{3}$–$1\frac{1}{2}$ millim.

Described from a large number of both sexes in the Indian Museum from the following localities:—Kasauli, Simla district, 6300 ft., 15. v. 08; Simla, 7000 ft., 10. v. 08; Phagu, Simla district, 9000 ft., 11. v. 09 (*Annandale*); Kichha, Naini Tal (plains), 4. iv. 09 (*Hodgart*); Darjiling, 8–11. viii. 09 (*Paiva*); Kurseong, 5000 ft., vi. and vii. 08 (*Annandale*); Calcutta, common in June, July, August; and the following localities from South India, collected by Dr. Annandale:—Trivandrum, 13. xi. 08; Shasthancotta, near Quilon, 7. xi. 08, "at light"; Maddathorai, 16–18. xi. 08; Tenmalai, 22. xi. 08; Nedumangad, near Trivandrum, 14. xi. 08; Ernakulam, Cochin, 4. xi. 08. In the Pusa collection from Pusa, 16–17. xii. 08.

Types in the Indian Museum.

In a specimen from Calcutta (3. vi. 08) there is a slight but distinct spot of black hairs at the tip of each of the veins, and the

tarsi are more densely covered with white scales. It may possibly be distinct, but I can detect no other differences of value.

Several specimens recently acquired by the Indian Museum through the generosity of Mr. C. W. Beebe, are in all probability this species, taken by that gentleman ten miles south of Kuching, Sarawak, Borneo, 25. vi. 10. Being mounted on microscopic slides their absolute identification is impossible, in the absence of any previous examination.

The species has been bred in Calcutta from a partially dried freshwater sponge from the edge of a garden pond.

At Kasauli, Dr. Annandale found the species common in bungalows on the date given. He has also taken it on mossy walls and at light in Calcutta.

166. Psychoda fulvohirta, *Brun.*

Psychoda fulvohirta, Brunetti, Rec. Ind. Mus. iv, p. 297 (1911).

♀. Body covered with blackish grey hairs, with the exception of the thorax, where the hairs are conspicuously *bright yellowish brown*, those of the alulæ being more yellow.

Head: antennæ as in *P. nigripennis*. *Legs* blackish, without any ornamentation. *Wings* with the appearance of those of *P. nigripennis*. The 2nd longitudinal vein forks distinctly beyond the base of the 3rd vein, and its anterior branch forks a little beyond the middle of the wing, very considerably beyond the fork of the 4th vein, which occurs towards its base; the 3rd vein is gently bisinuate. The hairs on the wings are blackish grey, those towards the base being blacker, and those of the posterior marginal fringe somewhat greyish.

Length $1\frac{1}{2}$ millim.

Described from two females from Darjiling, 7000 ft., 7. viii. 09, type (*Paiva*), and Kurseong, 26. vi. 10 (*Annandale*), both in the Indian Museum.

The bright yellowish brown colour of the hairs on the thorax makes this species easily distinguishable from all others except those specimens of *P. margininotata* with similarly coloured hairs, but from that species the wholly unmarked wing and unornamented tarsi will readily separate it.

167. Psychoda vittata, *Brun.*

Psychoda vittata, Brunetti, Rec. Ind. Mus. ii, p. 377 (1908); id., *op. cit.* iv, p. 298 (1911).

♂ ♀. Body pale yellow with grey and white hairs.

Head with white bristly hairs between the eyes, and black bristly hairs below. Scape of antennæ with the joints barely broader at the tip, both with black bristles, the second rather short; flagellum of ten dirty yellow, distinct, long-necked, flask-shaped joints, each surrounded by a thick verticel of stiff blackish grey hairs, also a terminal conical joint which is composed of three

small coalescing subspherical ones. The antennæ have the thickened appearance noticeable in *P. nigripennis*. *Legs* pale yellow, with a few irregular black bristles; hind femora with a row of long bristles, and hind tibiæ with two rows of long bristly hairs. Tibiæ with a few black spines at the tip. *Wings* distinctly lanceolate, pale grey; the veins bearing the usual blackish grey hairs, with a wide transverse band (composed of erect light brown hairs) across the centre of the wing, and the apical portion of the wing is also broadly covered with similar brown hairs; at the base of the wing is a space covered with erect, soft, white hairs, and some traces of a similar patch towards the costa between the two areas of brown hairs. Fringe of wing on costa brownish grey, on posterior margin more grey or whitish. The fringe of the wings is darker on the section contiguous to the brownish band of hairs, and also in the neighbourhood of the wing-tip. A good specific character is the curved nature of the middle veins of the wing (2nd, 3rd, and 4th with their branches), which distinguish it to some extent from its nearest allies, *P. nigripennis* and *P. fulvohirta*.

Length 1 millim.

Described from one male taken by Dr. Annandale at Maddathorai, South India, 18. xi. 08, and five females from Calcutta, 21. vi. to 2. viii. 08, also taken by the same gentleman on mossy walls.

Types in the Indian Museum.

Of the " further specimens " referred to by me, after the original description of the species, as being in the Indian Museum, two are now destroyed and the other two are certainly *P. vittata*, one being from Calcutta, 16. xi. 08.

Genus PERICOMA, *Walk.*

Pericoma, Walker, Ins. Brit., Dipt. iii, p. 256 (1856).

GENOTYPE, *Trichoptera fasciata*, Mg.; by designation of Coquillett (1910).*

This genus closely resembles *Psychoda*. The antennæ are 16-jointed, the palpi 5-jointed, and the 3rd longitudinal vein ends *below* the wing-tip, instead of exactly at the tip as in *Psychoda*. The tegulæ or squamæ are much more highly developed.

As in the preceding genus, there are often small spots, formed of scales, on many parts of the wings and legs, and occasionally on other parts of the body. The wing-surface is usually clear of hairs, but in some species it is closely covered with them in addition to the hairs on the veins. Small specific differences in the relative positions of the veins occur, as in *Psychoda*. The genital organs in both sexes are similar to those in *Psychoda*.

Range. Probably world-wide; though there is no record from

* I have seen no other species suggested as a genotype.

Australasia, South or Central Africa, or Asia, apart from those described comparently recently from India.

Life-history. The larvæ live in fungi or rotting vegetable matter. The imagos inhabit similar situations to those in which *Psychoda* is found.

The life-history of a European species (*Pericoma canescens*, Mg.) has been studied. The larva is about 8 millim. in length, 11-segmented, cylindrical, but tapering at each end. Head small, free moving, with well-developed mouth parts. Thoracic segments distinct ; the abdominal segments rather closely compressed, approximately subequal in length, each (except the last one) with three transverse marks on the dorsum. Underside of thoracic segments with some transversely placed bristles ; six on the 1st segment, eight on the 2nd and four on the 3rd. The abdominal segments 1 to 7 bear in the middle two small thickened chitinous plates ; all the segments furnished with bristly hairs.

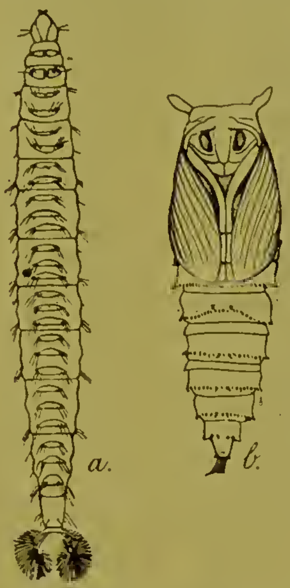

Fig. 33.—*Pericoma canescens*, Mg., a European species: *a*, larva ; *b*, pupa (after Miall).

The larva lives in shallow water, where it covers itself with mud, sand and morsels of plant-débris, leaving the anal end in contact with the surface of the water. It emerges from the water to pupate ; the pupa being about $3\frac{1}{2}$ millim. long, with long cylindrical transversely ringed anterior stigmata. The wing- and leg-cases reach to the 2nd abdominal segment, all the abdominal segments having a wreath of small teeth on their hind borders. On the ventral side of segments 3 to 6 are two distinct teeth, segment 7 bearing four stronger teeth.

Table of Species.

1. Wing with two rows of depressed scales on all the veins from the base to the middle, where they gradually develop into bristly hairs . . . . *squaminervis*, Brun., [p. 237.

   Wing without scales, except small ones in the nature of tufts forming spots at the tips of the veins or at or near their forkings. 2.

2. Wing membrane completely covered with comparatively soft black hairs, in addition to those on the veins . . . . *annandalei*, Brun., [p. 237.

   Wing membrane wholly destitute of hairs (except an isolated one or two near the margin and a few at extreme base of wing); the hairs placed exclusively on the veins. . 3.

3. Lower branch of 4th longitudinal vein with a distinct appendix at its basal angle. Antennæ of male with six prominent erect spines on the upperside of the 1st flagellar joint, which is considerably lengthened. Antennæ of female without such spines, the 1st flagellar joint not abnormally lengthened . . . . *spinicornis*, Brun., [p. 238.
Lower branch of 4th longitudinal vein without such appendix at its basal angle. The 1st flagellar joint not abnormally lengthened in either sex, and always without the prominent spines . . . . 4.
4. Wing with small but distinct spots at the tips of many or all of the veins, composed of black or white hairs, scale-like hairs, or true scales, often a black and a white spot both present at the tip of the same vein . . 5.
Wings without distinct hair- or scale-spots at tips of veins. Hairs on veins long enough to overlap those of the adjacent veins. No white scale-spots on wings . . 10.
5. A distinct section of the marginal fringe at the tip of the wing composed wholly of white or whitish hairs. The 2nd longitudinal vein forks before the base of the 3rd vein . . . . 6.
No distinct section of white hairs in the marginal fringe at the wing-tip . . . . 7.
6. Metatarsus normally black, except for an apical fringe of small white scales. Marginal fringe of wing with sections composed of grey or whitish grey hairs . . . . *margininotata*, Brun., [p. 240.
Metatarsus with at least the apical half covered with whitish scales.* Marginal fringe of wing with only one arc of whitish grey hair, which is apical . . . . *metatarsalis*, Brun., [p. 243.
7. Distinct bright yellow hairs in short sections on the veins, these sections so situated as to form an irregular transverse line from the costa to near the distal end of the posterior margin. Costa with very thick black bristly hairs. The 2nd longitudinal vein forks beyond the base of the 3rd vein . . . . *mixta*, Brun., p. 244.
No distinct sections of bright yellow hairs on the veins, any hairs of such colour being isolated and exceptional. Costa with only normally black or blackish hairs, with some sections of lighter coloured hairs . . 8.
8. Tarsi (apart from metatarsi) wholly white . . 9.
Tarsi black; apical third of fore metatarsi and tips of posterior metatarsi with small white scales . . . . *proxima*, Brun., [p. 245.

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* In two out of the three specimens present before me it is wholly covered with the whitish scales, except rather narrowly at the base.

9. Metatarsi wholly white. The 2nd longitudinal vein forks before origin of 3rd vein . . . . *lacteitarsis*, Brun., [p. 245.

Metatarsi black with white scales at tips. The 2nd longitudinal vein forks distinctly beyond origin of 3rd vein . . . . *gilvipes*, Brun., [p. 246.

10. Wings rather smaller than usual. The 2nd longitudinal vein forks (apparently) beyond the base of the 3rd vein . . . . *impunctata*, Brun., [p. 247.

Wings very large. The 2nd longitudinal vein forks immediately beyond the base of the 3rd vein . . . . *unicolor*, Brun., [p. 247.

168. **Pericoma squaminervis**, *Brun.*

Pericoma squaminervis, Brunetti, Rec. Ind. Mus. iv, p. 303 (1911).

♀ (?). Body covered with light brown and greyish hairs; ground-colour of thorax light brown, that of abdomen blackish.

Head: antennæ as in *Psychoda bengalensis*. *Legs* brownish grey, tarsi distinctly lighter, almost as in *P. lacteitarsis* when viewed from certain directions. *Wings* with a depressed row of elongate brown scales on each side of each vein, from the base to beyond the middle of the wing, where they gradually become narrower until eventually, towards the margin of the wing, they are replaced by stiff hairs; the scales lie close together, although not always touching one another, and are long enough to overlap those emanating from the adjacent veins. A distinct spot of bristly black hairs at the tip of each vein, and apparently a slightly clearer spot in the wing immediately in front of the vein-tip.

Length $1\frac{1}{2}$ millim.

Described from a single specimen (apparently a female) in the Indian Museum taken by Dr. Annandale at Kurseong, 4. viii. 08.

A very distinct species from all the others, readily distinguished by the conspicuous, scaled veins.

169. **Pericoma annandalei**, *Brun.*

Pericoma annandalei, Brunetti, Rec. Ind. Mus. ii, p. 380 (1908).

♀. *Head*: frons with long greyish white bristly hairs, and a few black bristles about the mouth. Eyes black, facets large, those on upper border of eyes bronze. Antennal scape thickly clothed with long white scales, and on upperside with some blackish brown ones; flagellum of thirteen elongated, cigar-shaped, light brown joints, clothed rather thickly with long, greyish white, bristly hairs. Palpi well developed, long, black, thickly clothed with black scaly bristles and hairs. Back of head black, bare. *Thorax* moderately shining black, with long black hairs which in certain lights have a blackish grey tint. Humeral calli bare, distinct, shining black. *Abdomen* black, with black bristly hairs. Ovipositor brown, of moderate size and normal

shape. *Legs* brown, with black and grey hairs, and both black and white bristles, the latter less numerous than the black ones. The tips of the tibiæ have a few white scales, the metatarsi are nearly wholly clothed thickly with white scales, and there are also a few at the extreme tips of the tarsi. *Wings* brownish grey, rather thickly covered with black hairs, and with a fringe of long black hairs around the whole border except at the tip of the wing, where, for the distance between the lower branch of the 2nd longitudinal vein and the upper branch of the 4th, the black hairs are replaced by long snow-white bristly hairs. Five spots on the wing-border (each consisting of a few silvery white scales, which have a faint bluish tint) are placed as follows: a larger one in the centre of the fore border, the second (a small one) just beyond the first; the third at the end of the lower branch of the 4th longitudinal vein; and the fourth and fifth at the tips of the 6th and 7th longitudinal veins, the fourth spot being the largest.

Length 2 millim.

Described from a perfect unique female captured by Dr. Annandale at Kurseong, 5. vii. 08.

Eight examples of this species have subsequently been acquired by the Indian Museum, captured by Dr. Annandale at Kurseong, 22–29. vi. 10, where he found them running over *Caladium* leaves at dusk, in thick jungle.

Type in the Indian Museum.

170. **Pericoma spinicornis**, *Brun.* (Pl. IV, figs. 4 & 15.)

> *Pericoma spinicornis*, Brunetti, Rec. Ind. Mus. ii, p. 378 (1908).
> *Pericoma appendiculata*, Brunetti, *l. c.* p. 379 (1908).

♂ ♀. Body blackish, rather sparsely covered above and below with whitish grey hairs, which are thickest towards the posterior borders of the abdominal segments, and are darker in some specimens. The posterior part of the thoracic dorsum bears long, black, bristly hairs.

Head: eyes bronze-black, facets very large; palpi long, brownish grey, with a few hairs. Antennæ 16-jointed, scape thick, 1st joint cylindrical, 2nd globular, both rather thickly beset with some elongate whitish grey scales, with which are mixed some long stiff black bristles, both of which are less developed in the female. In the male a very conspicuous and unique character occurs in the first joint of the flagellum, which is three and a half times as long as the second, sub-cylindrical, slightly narrowed and rounded at the base, and slightly contracted just before the tip. This joint bears on its upper surface a row of six long, strong, black, vertical straight spines, set in raised sockets, followed almost at the apex of the joint by two (perhaps three) other still longer spines springing from a common socket; the underside of this joint is beset with narrow curved greyish scales. The remainder of the flagellum consists of thirteen subequal, elongated

joints, gradually shortening to the last one, which is styliform. In the female the flagellum has fourteen ovate joints, each with a rather thin verticel of hairs; first joint only barely longer than the second, without spines. In the male the face and the anterior part of the thorax bear nearly white bristles which become almost scale-like. *Abdomen*: genitalia of male somewhat different from the usual generic type; the basal joint of the upper pair of claspers being large and broad, sickle-shaped, bearing about twenty spatulate spinules on its distal two-thirds, whilst the second or terminal joint takes the form of cylindrical chitinous filaments coiled in a spiral. The genital apparatus in the female consists of a single, horny, pointed, bare appendage of moderate size, projecting rather prominently. *Legs* pale yellowish white, femora distinctly curved, especially the fore and hind pairs, the amount of curvature variable; the femora with some close-lying small scales. The femora and tibiæ are covered with long, pale yellowish grey, bristly hairs; the tips of the tibiæ having a circlet of rather elongate, whitish scaly bristles, with some short black bristles intermixed; the tarsi are covered with black scales and bristly black hairs. The base of the metatarsus, and of the following joint, and the tip of the last joint are covered with small, cream-white scales. *Wings* dark grey. The lower prong of the 4th longitudinal vein springs at right angles from the upper, and then forms a second right angle, bearing a distinct appendix at that spot, directed backwards. The 4th longitudinal vein forks a little before the fork of the 2nd, which itself is placed just before the centre line of the wing. The veins, which are very distinct, all bear the usual double row of suberect hairs, directed forwards and backwards, and at the tip of each vein is a small bunch of stronger bristly hairs; the intervening space (especially on the hind border) being nearly clear, thus giving the border of the wing the appearance of bearing alternate black and white spots. The hairs are in the main black, but those on the proximal half of the disc (except those in the immediate vicinity of the third vein) are distinctly more erect than the others, and are distinctly grey. In the centre of the wing are short rows of quite white short bristly hairs placed at irregular intervals along the veins, these hairs being intermixed with black ones towards the base of the wing. A thick row of bushy, long, black bristly hairs on nearly the whole length of the seventh vein. Wing-border with a fringe of black hairs which is rather short on the apical half, longer on the basal half of the costa, and longest and thickest on the basal half of the posterior border; it appears lighter or darker according to the direction of the light falling on it. Towards the end of some of the veins are a few silvery white, irregularly placed, elongated scales.

Length $1\frac{1}{2}$–2 millim.

Described originally from eight males and ten females (the former as *spinicornis*, the latter as *appendiculata*, with a surmise that they represented the sexes of a single species); the specimens

being from Kurseong, 5. vii. 08 (*Dr. Annandale*). The species is quite common along the Himalayas from their base (Siliguri) to an altitude of at least 9000 ft., and occurs from early in May to October.

The Indian Museum possesses a good series bearing the following data :—Darjiling, 7000 ft., 2. x. 08 and 26–28. v. 10, common (*Brunetti*) ; 6–11. viii. 09 (*Jenkins*, *Paiva*) ; Kurseong, 5000 ft., iii., vi., vii., ix. (*Annandale*, *Lynch*, *Gravely*) ; Siliguri, base of Darjiling Hills, 18–20. vii. 07 (*Hodgart*) ; Simla, v., on windows (*Annandale*) ; Phagu, 9000 ft., 11. v. 09 (*Annandale*) ; Naini Tal, 6000 ft., 2. vi. 09 (*Hodgart*).

Types in the Indian Museum ; cotypes, ♂ and ♀, in my collection.

This is the only species in the family known to me in which such a striking sexual difference is found. Taken in consideration with the appendiculation of the 4th longitudinal vein near its base, a separate subgenus might be formed for it, but slight appendices occur occasionally in other species when the basal section of a vein forms a sharp angle ; in *Pericoma margininotata*, for example, it is I think constant at the basal angle of the 3rd vein.

171. Pericoma margininotata, *Brun.*

Pericoma margininotata, Brunetti, Rec. Ind. Mus. ii, p. 381 (1908) ; id., *op. cit.* iv, p. 304 (1911).
Var. *Pericoma bella*, Brunetti, *op. cit.* ii, p. 383 (1908).

♂ ♀. Ground-colour of thorax blackish brown, of abdomen blackish, both covered with thick, long, pale yellowish grey, bristly hairs, plentifully intermixed on the thorax with black hairs, and likewise, to a less degree, on the base of the abdomen. The hairs on the thoracic dorsum show a tendency to be arranged in fan-shaped sets. On the abdomen they are arranged in a thick row of long ones on the posterior border of every segment, with a shorter, erect row in front of them. Pleuræ light to dark mahogany brown, bare, or nearly so.

Head : eyes bronze, with large facets. The antennæ have two large basal joints covered with short white scales and surrounded by a cluster of longer ones ; the second scapal joint subglobular, a little more than half as long as the first, which is cylindrical, twice as long as wide ; flagellum of fourteen small globular or subconical joints of equal size, last one conical, each with a circlet of a few long black hairs, and more numerous short white ones. Sometimes the last joint is constricted, giving the appearance of a 15-jointed flagellum. *Abdomen* : genitalia of male with superior appendages consisting of a short, stout, cylindrical basal joint, and a distal one which is shaped like a scorpion's sting, consisting of a basal bulb, and a slightly coiled, tube-like prolongation of about the same length. Inferior appendages arising from a broad, rather short basal plate, than which they are considerably larger ;

themselves sickle-shaped, each bearing at the distal end, on the dorsal surface, a pair of flattened, spatulate spinules; the whole joint covered with fine hairs. *Legs*: femora and tibiæ grey, with minute greyish white pubescence, a number of longer, white bristly hairs (with black reflections in certain lights). These are apparently irregularly placed on the fore legs and the femora, but show a tendency to form longitudinal rows; those, at least, on the hind tibiæ are often arranged in three such longitudinal rows, one pointing outwards, the other two posteriorly. The apical part of the tibiæ is narrowly but thickly clothed with jet-black scaly bristles, and the extreme tip with a circlet of white scaly bristles. The tarsi are thickly covered with jet-black scaly bristles, the tips of the metatarsus and following joint bearing a circlet of white scaly bristles; the metatarsus bears several very strong black bristles, and the extreme tips of the tarsi have minute cream-coloured scales. *Wings* dark grey, with all the veins bearing a double row of spreading hairs, and without scales. Upper fork of 2nd longitudinal vein bifurcates at two-fifths of the wing, and the 4th longitudinal bifurcates between one-fourth and one-third of the wing. A small spot, consisting of numerous rather strong black hairs, at the tip of each vein, and a similar spot at the bifurcations of the upper prong of the 2nd longitudinal vein, and of the 4th vein, these two spots being in a straight line with the last spot on the posterior margin; the first spot on the anterior border, the last one on the posterior border, and the upper discal spot, are all generally larger and darker than the others. Normally the spot at each wing-tip consists of a black hair-spot, and a small white scale-spot, placed very close together, the latter sometimes almost in the marginal fringe. The hairs in some parts of the disc of the wing are distinctly darker and show a tendency to form black patches, and along most of the veins are short rows and bunches, here and there, of quite white, erect, short, bristly hairs, becoming almost scale-like in the small tuft-like spots of them on the margin of the wing, placed alternately with the black marginal hair-spots. These give the border of the wing a strikingly distinct, tesselated appearance composed of black and white spots alternately. The costal fringe comprises some short sections composed mainly of white or whitish hairs, including generally a section of some length just beyond the middle; whilst the wing-tip is always clothed with white hairs for some distance, there being also some few short patches of white hairs in the fringe of the posterior margin. Halteres rather large, cup-shaped, with hairy upper edge, the stem being very narrow and short.

Length $1\frac{1}{4}$–$1\frac{3}{4}$ millim.

Types in the Indian Museum.

Var. **bella**, *Brun.*

♀. Body covered with dense, greyish white bristly hairs; very dense between the eyes and on the lower part of the face; arranged on the abdomen in transverse rows at the base of each segment.

They are long and semi-erect, thus covering most of the abdominal surface.

Head: antennæ with both joints of the scape covered with dense white scales, both appearing dark at their bases; flagellum of fourteen subconical joints, the apical one produced to a blunt conical point, each joint bearing a verticel of hairs, the whole flagellum having a grey appearance. Palpi black, with white bristly hairs; the 4th joint the longest and thinnest. *Legs*: femora with long bristly grey hairs; hind pair thickly covered with whitish scales. Tibiæ blackish brown with long, irregularly placed bristles; a ring of close, short, black bristles towards the tip, and a circlet of closely packed, elongated, white scales at the tip. Metatarsus and tarsal joints black, with a circlet of short white scales at the tip of most of them. *Wings*: fork of the upper branch of 2nd longitudinal vein and the fork of the 4th vein both occurring a little before the middle of the wing. The upper branch of the 2nd vein, immediately after its origin, takes a rather sudden curve upwards, descending slightly to where it forks, and the lower branch ends only slightly above the extreme tip of the wing; the 3rd vein originates in a right angle from the 2nd vein,* just beyond where the latter forks, its basal portion very narrow but quite distinct in wings denuded of vestiture, and there is a distinct appendix at the angle. The veins bear the usual double row of greyish, semi-erect hairs, and patches of black, erect, bristly hairs are distributed as follows:—at the fork of the upper branch of the 2nd vein, and at (or just beyond) the similar fork of the 4th vein; also about the middle of the 6th and along the 7th, except in its centre. The fringe round the border of the wing is generally greyish white, with an arc of black bristly hairs near the middle of the costa, and just beyond the middle; on the posterior border between the lower fork of 4th vein and the 5th; also from the end of the 6th nearly to the base of the wing.

Described from six females taken by me on windows at Darjiling during the last few days of September, and on October 1st, 1908. It was not uncommon.

Type in the Indian Museum.

The patches of black hairs on the wing are by no means of regular size or shape, but the markings of the six examples examined agree fairly well with the distribution of black hairs as herein described. Small irregular patches occur in nearly all the specimens. Sometimes the general appearance of the wing is wholly blackish or black, with a slightly curved band of lighter hairs across it near the tip; a patch of white hairs in the middle of the costa, and beyond the middle on the hind border, and also at the tip of the wing.

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* Not from the 4th vein, as erroneously stated in my original description.

Although described originally as two species there can be little doubt that the forms *P. margininotata* and *P. bella* represent but a single species. The descriptions of the two forms are retained, with some slight corrections as tending to facilitate recognition of each, but intermediate forms are frequent, in fact the *bella* form is much the more numerous, and is more constant in the wing-markings. The following notes compiled from the examination of a long series in the Indian Museum refer to the species in general.

The species is very variable in its coloration, but it is clear that the black hair-patches on the wing are tolerably constant, especially those at the fork of the upper branch of the 2nd longitudinal vein, and at the fork of the 4th vein. The hairs at the wing-tip are generally wholly white, always mainly so. The colour of the hairs on the dorsum of the thorax varies from greyish white to rather bright reddish brown, all intermediate shades being represented in different individuals. The tarsi are best described as variable; generally pale yellowish at the base, darkening to dark brown at the tips; with long irregularly placed bristly hairs, which are pale on the basal half of the tarsi and dark brown on the apical half, being concolorous with the ground-colour of the limb. The rest of my description of the tarsi is correct, but it may be added that the distance covered by the white apical scales at the tips of the basal joints of the tarsi varies, especially on the 2nd tarsal joint, which is in some examples all white, the colour in all cases being that of the *scales*, as the ground-colour of the whole tarsus is always black.

The Indian Museum has this species from Darjiling, 7000 ft., 26. v. 10 (*Brunetti*); 5–11. viii. 09 (*Dr. Jenkins, Paiva*); Kurseong, 25–27. vi. 10 (*Annandale*); Simla, 25. iv. 07, 11. v. 08, 9–10. v. 09 (*Annandale*); Phagu, 9000 ft., Simla district, 11–15. v. 09 (*Annandale*); Pallode, 20 miles N.E. of Trivandrum, South India, 15. xi. 08 (*Annandale*).

172. Pericoma metatarsalis, *Brun.*

Pericoma metatarsalis, Brunetti, Rec. Ind. Mus. iv, p. 305 (1911).

♀. This species differs from the *bella* form of *P. margininotata* in only two characters, but these are practically constant in the three examples examined.

The metatarsus is, with the exception of its immediate base, covered rather thickly with whitish scales (in the type and in one other specimen), or at least for more than the apical half (as in the third specimen). In *P. margininotata* the last three tarsal joints often have a greyish or blackish grey appearance, but in the present species they are all uniformly intensely black. The second character is that the fringe of the wing possesses no admixture of whitish hairs either singly or in short sections, with the exception of a broad section at the tip, comprised

between the lower branch of the 2nd longitudinal vein and the upper branch of the 4th vein. The 2nd longitudinal vein forks a short distance before the base of the 3rd vein, at which spot is placed the anterior cross-vein; the fork of the anterior branch of the 2nd vein is distinctly before the fork of the 4th vein.

Length $1\frac{3}{4}$ millim.

Described from three females from Simla district, two from Simla, 9. v. 09 (*type*) and 12. v. 09, the third from Phagu, 9000 ft., 11. v. 09, all taken by Dr. Annandale.

Type and the other specimens in the Indian Museum.

In view of the close affinity of *P. lacteitarsis* and *P. gilvipes* to *P. margininotata*, although they appear to be perfectly good species, there seems no reason to refrain from establishing the present form as a distinct species.

173. Pericoma mixta, *Brun.*

Pericoma mixta, Brunetti, Rec. Ind. Mus. iv, p. 306 (1911).

♀. Of the general appearance of *P. margininotata* var. *bella*. Body with blackish and grey hairs, the former predominating chiefly on the dorsum of the thorax and at the base of the wings.

Legs dark yellowish grey, thickly clothed with stiff bristly hairs; the tibiæ, the metatarsi and 2nd joint of tarsi with a narrow circlet of whitish scales at the tips of each. *Wings* having a dark brown appearance. The 2nd longitudinal vein forks some little distance beyond the base of the 3rd vein, althongh still quite near the base of the wing, as the latter vein begins sooner than in most species, its exact origin near the root of the wings being obscured by the pnbescence; the fork of the upper branch of the 2nd vein and the fork of the 4th vein are approximately opposite one another. The veins are closely covered with a double row of black or dark brown hairs, with a distinct black hair-spot at the tip of each vein; a few small pale hairs in front of some of these black hair-spots; some erect shortsnow-white hairs towards the bases of the veins, and others on the three branches of the 2nd vein, placed at some little distance before their tips; also to a less extent in short sections on the veins in other parts of the wing. A number of bright yellow hairs, distributed:—(1) along the veins, apparently thickest along the costa, especially at its base, intermixing with the normal thick black or dark brown hairs forming the fringe; (2) at the bases of the veins, but disposed in small sections separate from the snow-white ones in that region of the wing; and (3) on the three branches of the 2nd longitudinal vein before the white hairs. To an apparently less extent they also occur on the veins in other parts of the wing. The wing-fringe on the posterior margin is really dark brown, although in some lights it appears light brown or even greyish here and there. The tip of the wing bears a few whitish

hairs, but the area is less white and less sharply defined than in *P. margininotata* var. *bella*.

Length 2 millim.

Described from a single female in good condition from Simla, 7000 ft., 6. v. 09 (*Dr. Annandale*).

Type in the Indian Museum.

174. Pericoma proxima, *Brun.*

Pericoma proxima, Brunetti, Rec. Ind. Mus. iv, p. 308 (1911).

? ♂. Body with dark brown hairs, intermixed with grey hairs here and there.

Head with bushy white hairs above, black hairs below and on the palpi. Antennæ with black scales on scape; flagellum as in *Psychoda bengalensis*; the verticillate hairs widely spread out, the hairs whitish. *Abdomen* with black hairs; the genitalia covered with bristly bright yellow hairs. *Legs* dark, with blackish scales, black bristles and paler stiff hairs; fore metatarsi with apical third bearing white scales, posterior metatarsi with white scales at tips only. *Wings* with rich, moderately dark chestnut-brown hairs only on the veins; very distinct and moderately large black hair-spots at tips of veins, where there are also some small white scaly hair-spots; isolated groups of a few white scaly hairs placed apparently irregularly on the veins; a distinct arc of white scaly hairs on the wing-fringe between the lower branch of the 4th longitudinal vein and the 5th vein, but the wing-tip itself has distinctly rich brown hairs and no trace of white hairs; the wing-fringe brownish grey; a distinct spot of black bristly erect hairs at the fork of the anterior branch of the 2nd longitudinal vein, and another at the fork of the 4th vein, both spots with a few white hairs beyond them. Anterior branch of 2nd vein forking approximately opposite the fork of the 4th vein, distinctly but not greatly before the middle of the wing. The pubescence hides the base of the wing sufficiently for it not to be clearly seen whether the 2nd longitudinal vein forks before or after the origin of the 3rd.

Length $1\frac{1}{3}$ millim.

Described from a single specimen (apparently a male) in good condition in the Indian Museum collection, taken at Peradenyia, Ceylon, viii. 1910 (*E. E. Green*).

175. Pericoma lacteitarsis, *Brun.*

Pericoma margininotata var. *lacteitarsis*, Brunetti, Rec. Ind. Mus. ii, p. 382 (1908).

Pericoma lacteitarsis, Brunetti, Rec. Ind. Mus. iv, p. 307 (1911).

This form, originally described by me as a variety of my *P. margininotata*, with the suspicion that it might prove distinct, is now, to my thinking, sufficiently established as a good species through the acquisition of several specimens by the Indian Museum.

The black hair-spots at the tips of the veins, the relative positions of the forks of the 2nd and 4th longitudinal veins, and the coloration of the tarsi are constant. The 2nd longitudinal vein forks before* the base of the 3rd vein; the anterior branch of the 2nd vein forks before the middle of the wing and a little beyond the fork of the 4th vein. There are no white hair-spots in the fringe of the wing, nor on the absolute margin of the wing (at or very near the tips of the veins) as in typical *margininotata*, which character alone is almost sufficent to distinguish the two forms. The whole wing has a more brownish appearance, without the variegated appearance of *P. margininotata*, and the absence of the white fringe at the wing-tip will at once identify it from that species. A second good character that I believe separates it from all other Oriental species is that the whole of the tarsi are milk-white. In the allied species, *P. margininotata*, *P. gilvipes*, *P. proxima* and *P. mixta*, some portion of the tarsus is always black, often the major portion.

Length $1\frac{1}{2}$ millim.

A specimen in the Indian Museum, taken by Dr. Annandale at Quilon, Travancore, 9. xi. 08, has the hairs of the body, on the tibiæ and metatarsi (except the tip of the latter) darker brown, also the lower branch of the 2nd longitudinal vein runs almost directly to the wing-tip. The blackish hair-spots on the disc of the wing, on the fork of the anterior branch of the 2nd vein, and on the fork of the 4th vein, are well marked. The original three specimens (females) were taken at Kurseong 4. vii. 08 by Dr. Annandale.

Type in the Indian Museum.

176. Pericoma gilvipes, *Brun.*

Pericoma lacteitarsis var. *gilvipes*, Brunetti, Rec. Ind. Mus. ii, p. 382 (1908).
Pericoma gilvipes, Brunetti, *op. cit.* iv, p. 308 (1911).

♀. Considerably resembling *P. margininotata*, but smaller, the general colour of the long hairs of the thorax and abdomen more brownish grey. The wings resemble those of that species, with a tendency to dark spots placed irregularly, but generally at the bifurcations of the veins. The distinguishing character is the absence of white hairs at the wing-tip and of white hair-spots on the margin of the wing, also of isolated small patches of erect white hairs on the veins. Another good character is that the 2nd longitudinal vein forks beyond the origin of the 3rd vein, instead of before it as in *P. margininotata*. The anterior branch of the 2nd vein forks a little before the middle of the wing, and a little beyond the fork of the 4th vein. The legs have the tarsi

* This is the case in the original type specimen (a female). In a second specimen the pubescence obscures a vein of the base of the wing. In a specimen mounted for the microscope, the 2nd vein forks beyond the base of the 3rd, and for this reason it is doubtful if it is of this species.

entirely covered with cream-coloured microscopic scaly pubescence, except the metatarsi, which are black nearly to their tips, this being the most striking specific character, and one by which the species is easily separated from *P. lacteitarsis*, its nearest ally. The genital appendages as in *P. margininotata*, but rather longer.

Length $1\frac{1}{4}$ millim.

Described originally from three females in the Indian Museum from Calcatta, dated 28. vii. 08 (*type*), 2. viii. 08, and 17–18. viii. 07. Additional specimens in the Indian Mueeum afford the following data :—Calcutta, 9. ii. 10, 17–18. vii. 07, 28. vii. 08, 8–23. viii. 08, 1–26. ix. 08 (all *Annandale*, some taken " at light ") ; Madhupur, Bengal, 17. x. 09, " at light " (*Paiva*); Ernakulam, Cochin, Malabar Coast, 4. xi. 08 (*Annandale*) ; Quilon, Travancore, 9. xi. 08 (*Annandale*).

177. Pericoma impunctata, *Brun.*

Pericoma impunctata, Brunetti, Rec. Ind. Mus. iv, p. 309 (1911).

Body thickly clothed with long, very dark brown bristly hairs ; the surface of the body itself also dark brown.

Head : antennæ brownish yellow. *Legs* with dark brown bristly hairs ; tarsi light brown but without traces of any pale scales at tips of joints. *Wings* thickly clothed on all the veins with a double row of dark brown bristly hairs, denser and more bristly along the costa and at the base of the wing. In certain lights the fringe of the wing and some of the stiff hairs on the basal part appear greyish, but the true colour of practically every part of the insect is dark brown.

Length $1\frac{1}{2}$ millim.

Described from one specimen (sex uncertain) from Tenmalai, west side of Western Ghats, Travancore, South India, 22. xi. 08 (*Dr. Annandale*).

Type in the Indian Museum.

The 2nd longitudinal vein apparently forks beyond the base of the 3rd vein, but the root of the wing is too closely covered with hairs to admit of exact observation.

178. Pericoma unicolor, *Brun.*

Pericoma unicolor, Brunetti, Rec. Ind. Mus. iv, p. 309 (1911).

This species is wholly brown in colour, only the tarsi being rather lighter.

Head: antennæ (partly broken) with flask-shaped flagellar joints. *Wings* very large, and with almost wholly dark brown hairs which appear rich golden brown in certain lights and show a violet tinge when viewed from different directions. The 2nd longitudinal vein forks immediately before the base of the 3rd vein, the anterior branch of the 2nd forking again near the middle of the wing, much beyond the fork of the 4th, which occurs towards the base, only shortly after the almost invisible posterior cross-vein, which latter is situated in a line with the

basal section of the 3rd vein. The hairs at the tips of some of the veins are blacker but do not form distinct spots.

Length $1\frac{3}{4}$ millim.

Described from a single specimen (sex uncertain) in the Indian Museum, from Kurseong, taken by Mr. D'Abreu, in November 1910.

Although the actual difference in length between this species and *P. impunctata* is so little, the present form has a much larger appearance owing to the considerable enlargement of the wings, which in *P. impunctata* are smaller than usual.

Genus BRUNETTIA, *Ann.**

Brunettia, Annandale, Rec. Ind. Mus. iv, p. 141 (1910).
Diplonema, Annandale (*nec* Loew), *op. cit.* iv, p. 39 (1910).

GENOTYPE, *Diplonema superstes*, Ann.; by original designation.

Heavy, moth-like flies, with broad, thickly scaled wings, which are held in a horizontal position during repose.

Head: mouth-parts not forming a proboscis; palpi long, with four joints. Antennæ 15-jointed, the scapal joints differentiated; each joint (except the last) of the flagellum bearing a couple of stout S-shaped chætæ as well as the ordinary pubescence. Eyes strongly emarginate. *Abdomen*: the male genital apparatus consists of an upper supra-genital triangular plate, which represents the last abdominal tergite and which projects over the genitalia proper. Curving downwards and inwards at the sides near the tip, it gives rise to a pair of relatively very large curved chætæ. Below these lie the upper pair of appendages, which are two-jointed, the second being flattened and spatulate. The lower appendages are rather long, curving upwards and inwards at their tips, bearing numerous spatulate spinules. In the female the usual horny ovipositor of the PSYCHODINÆ is absent. *Wings* very broad, shaped like a diamond with rounded angles. A conspicuous feature is the great distance between the costa and the 1st longitudinal vein, due to the strong outward curve which the anterior border of the wing takes near its base. Auxiliary vein almost obsolete; 1st longitudinal ending just beyond middle of wing; 2nd longitudinal forked quite near base, the anterior branch forked again almost immediately; 3rd vein ending just below wing-tip. The 4th vein forks quite near the base, approximately opposite fork of anterior branch of 2nd vein; the 5th springs from the 4th, a little before the fork of the latter; the 6th and 7th are distinctly present, as in *Psychoda* and *Pericoma*. All the veins straight or gently curved.

The principal characters of this genus are the closely scaled wings in conjunction with the very prominent S-shaped antennal chætæ; its very broad, almost heart-shaped wings; and its *Psychoda*-like venation.

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* For observations on this and the next genus, see Rec. Ind. Mus. iv, p. 310.

179. **Brunettia superstes**, *Ann.* (Pl. IV, figs. 1, 3 & 9.)

Diplonema superstes, Annandale, Journ. Asiat. Soc. Bengal (new ser.), iv, p. 353 (1908).
Brunettia superstes, Annandale, Rec. Ind. Mus. v, p. 142 (1910).

♂ ♀. Body sooty black, with a strong white refulgence; the first joint of each tarsus partly white, the extent of the white portion varying with the incidence of light.

Head: "Antennæ with fifteen joints; the basal joint cylindrical, the second almost discoidal, these two (the scape) covered with scales; each joint of the flagellum except the last bearing, in addition to a broad basal band of hairs, a long, stout S-shaped chæta on either side; joints of the flagellum spindle-shaped, the distal end of each smooth, devoid of hairs; the last joint bearing hairs only, produced at the tip into a minute, cylindrical, blunt process covered with exceedingly fine pubescence. Palpi four-jointed; the 1st joint short, the others longer, subequal; the whole organ covered with flattened hairs, which gradually take the form of scales towards the base of the 2nd joint" (*Annandale*). *Thorax* and *abdomen* covered with bristly hairs, some scales intermixed with those of the thorax, a dense tuft of semi-erect scales on

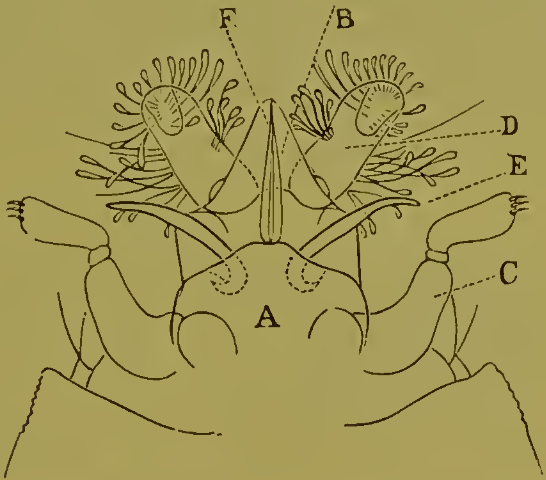

Fig. 34.—Male genitalia of *Brunettia superstes*, Ann.

the anterior border of the latter. "The male genitalia can now be described in detail, for it has been possible to examine specimens preserved in spirit; to give a satisfactory account of their structure from dried specimens is very difficult. The arrangement of the appendages, etc., is clearly shown in the text-figure, which is drawn from a specimen mounted in canada balsam. (A) represents the supergenital plate (last abdominal tergite), which is thin and membranous, transverse, subtriangular, with the apex slightly

emarginate. At either side it becomes chitinized and bending downwards and inwards gives rise to a very stout chæta (E), which bends outwards and slightly downwards. This structure does not appear to be homologous with any in the genitalia of *Phlebotomus*, *Psychoda*, or *Pericoma*. On either side, at a lower level, however, there is an appendage (C) evidently homologous with the superior appendage of these genera. It consists of two joints, the proximal of which is stout in form and somewhat conical, while the distal joint is flattened and membranous, its sides being sinuous and its tip truncate or very broadly rounded. There are three or four short sensory hairs at the tip, but otherwise the appendage is naked; its integument is thin. The subgenital plate (B) projects as a narrow triangle; its integument is rather thick and bears a minute pubescence. The inferior appendages (D) are borne at the base of the subgenital plate. In the dried specimen they appear to be short and rounded, but they are actually elongate and pointed, with the tips curved upwards and forwards. They bear numerous long hairs and spatulate spinules, each of which has a fringe of minute spines round its flattened extremity. These spines are all turned inwards towards one surface of the spinule. The intromittent organ (F) consists, as in *Phlebotomus*, of a pair of narrow flattened chitinous valves closely pressed together, the fissure between them being vertical, with a pair of delicate chitinous filaments that can be thrust out between them. The form of the organ in this species is narrowly conical" (*Annandale*). *Wings* shaped somewhat like a diamond with rounded corners. The

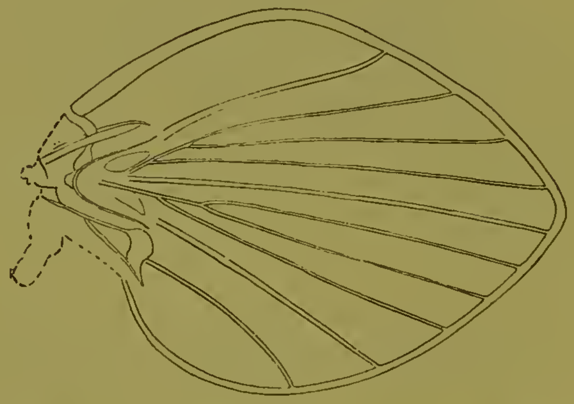

Fig. 35.—*Brunettia superstes*, Ann., wing.

length of the wing is to its greatest breadth as 4 to 3. The surface of the wing covered with overlapping spatulate scales, which are narrower near the margins than at the middle and base of the wing. The veins clothed with a double row of divaricate hairs; costal fringe of hairs especially long on posterior margin and towards the base, where there is a flat tuft of very long silky black hairs.

Length 3 millim., expanse of wings 8 millim.

"The original specimens were taken at an altitude of about 5000 feet at Kurseong during the 'rains' (July) on a window-pane and on the upper surface of a fern-frond. They rested with the wings spread out quite flat. I have recently (June 1910) taken other specimens at the same place. They were running erratically on the leaves of *Caladium* in dense jungle at dusk." (*Annandale.*)

Types in the Indian Museum.

Genus PARABRUNETTIA, *Brun.*

Parabrunettia, Brunetti, Rec. Ind. Mus. iv, p. 311 (1911).

GENOTYPE, *Psychoda squamipennis*, Brun.

This genus differs from *Brunettia* primarily in the fact that the 3rd longitudinal vein ends *at* the tip of the wing and not *below* it. Its other distinctive characters are :—(1) The presence of closely placed dark imbricating scales on at least some considerable portion of the wings, on both their upper and lower surfaces, or on the underside alone *. (2) The surface of the wing generally rather thickly covered to some considerable extent with more or less longitudinally placed hairs †. (3) Chætæ present on the flagellar joints (possibly not on all of them), irrespective of the apical joint, which, even in *B. superstes,* is devoid of them : they are not so large or so conspicuous in any of the species as they are in *B. superstes,* and appear to vary a good deal in size, according to the species. ‡

In many species there is a rather noticeable patch of long smooth depressed silky hairs extending posteriorly from the alulæ, which may probably figure as a secondary character of the genus.

Owing to the denseness of the vestiture of the wings (the basal hairs, the surface hairs, and the opacity of the scales), it has been impossible to note the exact position of the forking of the 2nd longitudinal vein in some of the species, but in all those in which it has been noted it occurs beyond the origin of the 3rd longitudinal vein.

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* Any species (if discovered) with scales on the upperside of the wing only, would logically fall into the genus.

† These are absent in two species provisionally placed here ; but this may be better regarded perhaps as a secondary character, as species both with and without hairs on the surface of the wings occur equally in *Psychoda* and *Pericoma.*

‡ Similar chætæ, but much smaller, have been detected by Dr. Annandale in *Pericoma margininotata* and *Psychoda distincta* ; so they cannot be considered of generic importance.

Table of Species.

1. Hairs thickly present on surface of wing	2.
Hairs wholly absent from surface of wing. The 2nd longitudinal vein forks beyond the origin of the 3rd vein	6.
2. Upper, as well as lower, surface of wing covered to a considerable extent with small dark imbricating scales............	3.
Upper surface of wing without any considerable area covered with scales; a few may be present at the base of the wing	4.
3. No white spots on wing-border. The 2nd longitudinal vein forks beyond the origin of the 3rd vein	*squamipennis*, Brun., [p. 252.
White spots on wing-border	*atrisquamis*, Brun., [p. 253.
4. Under surface of wing wholly covered with dark scales..........................	5.
Under surface of wing with scales covering at most the basal half. The 2nd longitudinal vein forks apparently beyond the base of the 3rd vein	*9-notata*, Brun., [p. 255.
5. A silvery white scale-spot below shoulder ..	*albohumeralis*, Brun., [p. 254.
No such silvery white spot................	*argenteopunctata*, [Brun., p. 254.
6. Hairs on anterior part of thorax brighter yellow	*flavicollis*, Brun., [p. 256.
Hairs on anterior part of thorax less yellowish *..............................	*longichæta*, Brun., [p. 256.

180. **Parabrunettia squamipennis**, *Brun.*

Psychoda squamipennis, Brunetti, Rec. Ind. Mus. ii, p. 375 (1908).

♀. Body blackish brown, with brownish grey hairs, which appear much lighter when the light falls on them in a certain direction.

Head: eyes black, large facets. Antennæ: first joint elongate, one and a half times as long as the second, which is short and subspherical; both with some bristly hairs; flagellum of apparently only thirteen joints, which are cup-shaped, with a central cylindrical prolongation, each joint bearing a thick verticel of long, close, scale-like, light brownish grey hairs, in addition to some ordinary hairs on each joint; the last joint tapers to a point and may really be separable into two. *Legs* with close, greyish pubescence, and some irregularly placed bristles of various lengths; some stiff black ones on the metatarsus. *Wings* with the surface between the veins closely covered with distinct, moderately large, brown scales, and both veins and the intermediate spaces covered with brown and black hairs. Border of wing with a fringe of long brown hairs, which appear grey

* Not a very definite distinction, but the species are certainly distinct.

in certain lights, and along the extreme edge of the wing is placed, here and there, a single, small, snow-white, scale-like hair.

Length 1¼ millim.

Described from a unique female in the Indian Museum collection, taken by Dr. Annandale in Calcutta, 5. viii. 07.

The example is apparently a female, as no trace of a genital appendage is visible; but from the manner in which the specimen is mounted, it is very difficult to see the body and legs.

181. **Parabrunettia atrisquamis**, *Brun.* (Pl. IV, fig. 2.)

> *Psychoda atrisquamis*, Brunetti, Rec. Ind. Mus. ii, p. 376 (1908).
> *Brunettia travancorica*, Annandale, *op. cit.* iv, p. 144 (1910).
> *Parabrunettia atrisquamis*, Brunetti, *op. cit.* iv, p. 312 (1911).

♀. Near *P. squamipennis* and *P. argenteopunctata*. The wings are entirely clothed on the surface as well as the veins with soft black hairs, more or less longitudinally placed on the basal half of the upperside, and the whole surface of the lower side of the wing is covered with brown or blackish short thick scales, which in certain lights appear partly iridescent on at least the underside. They also appear, viewed from different points, silky black or dull greyish white. At the tip of each vein is a small bunch of snow-white, moderately long, scale-like hairs, placed on the absolute edge

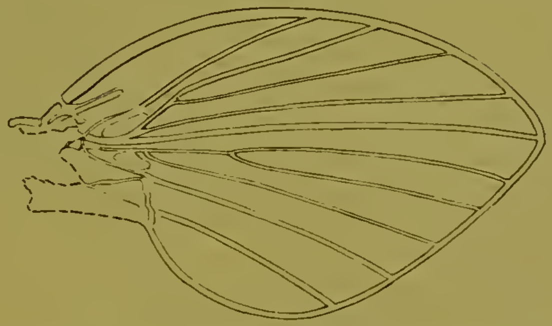

Fig. 36.—*Parabrunettia atrisquamis*, Brun., wing.

of the wing, almost in the adjacent fringe. The legs are almost wholly black, with a few small white scales at the tip of the tibiæ and (at least on the hind pair) a few at the tip of the metatarsus and succeeding joint. The species is coal-black.

Length 1½ millim.

Described from a perfect unique female in the Indian Museum, taken on the window of that building by Dr. Annandale, 22. vii. 08 (*type*), and some specimens taken by Mr. E. E. Green at Peradeniya, Ceylon, 18. vii., 14. viii., and x. 1910, also in the same collection.

A specimen in the Indian Museum, unfortunately in too bad condition to describe, certainly represents an undescribed species

allied to *P. atrisquamis*, from which it differs by the scales on the under surface of the wings covering the basal half only; no obvious patch of silky hairs on the alulæ; and by traces of small white spots on the extreme border of the wing.

182. Parabrunettia albohumeralis, *Brun.*

Parabrunettia albohumeralis, Brunetti, Rec. Ind. Mus. iv, p. 312 (1911).

♀. Body covered with dark blackish brown hairs, which, at least on the abdomen, appear dark greyish in certain lights. A small but very conspicuous tuft of snow-white scaly hairs at the sides of the thorax, nearly below the shoulders, a little in front of the base of the wing.

Head: antennæ with the general appearance of those of *Psychoda bengalensis*. *Legs* with brown hairs and scales, which are darker on the tarsi. Tips of tibiæ and of metatarsi with white scales. *Wings* with surface closely covered with dark brown hairs; the upper surface without any covering of scales except a very few at the base and the small ones forming the white spots; underside of wing closely covered with small dark brown imbricating scales, extending almost to the margin; conspicuous, though small, spots, composed of elongate snow-white scales, appear to be placed normally at the tips of nearly all the veins, but in the three examples present there is a little variability in their exact position. In the type they occur as follows:—at a little distance before tip of 1st longitudinal vein; shortly before the 1st ending of the 2nd vein; at tips of the other two endings; at tip of 3rd vein, both branches of 4th, the 5th and 7th. A single white hair still remaining shows another spot to be present on the 7th vein some little distance before its tip. Tip of 6th vein without a spot. In one example there is a white spot behind the tip of the 6th vein; in another specimen the spot is at the vein-tip.

Length $1\frac{1}{4}$–$1\frac{1}{2}$ millim.

Described from three specimens (females) from Peradeniya, taken by Mr. E. E. Green, ix. and x. 1910.

Type in the Indian Museum.

The white shoulder-spots immediately distinguish this from all other species.

183. Parabrunettia argenteopunctata, *Brun.*

Psychoda argenteopunctata, Brunetti, Rec. Ind. Mus. ii, p. 375 (1908).

Considerably resembling *P. squamipennis*.

♀. *Head*: the antennæ have a flagellum of thirteen spindle-shaped joints each bearing a thick verticel of hairs. Mouth with rather long bristles; the four-jointed palpi are thin, moderately hairy, gradually tapering towards the tip, the second joint being twice as long as the first, the rest subequal. *Abdomen*: the

genital appendage appears bare, conical, horny, upright. *Legs* covered with brownish scales which, in certain lights, show a greyish white sheen. The tibiæ have rather long hairs of irregular length, and a circlet of strong bristles of different lengths at the tip; the apical half of the metatarsus has some white scales. *Wings*: the 2nd longitudinal vein divides almost directly after its divergence from the 3rd, and the prong forks at a quarter the length of the wing; the 1st longitudinal vein ends at the centre of the costa; the 3rd ends at the extreme, slightly blunted, tip of the wing; the 4th divides from apparently a common stem just below the divergence of the 2nd and 3rd, the 4th forking a little beyond the fork of the upper prong of the 2nd; the 7th is curved downward at the tip. The wings have a small spot of snow-white scale-like bristles at the tips of all the veins (not always very distinct), and two rather larger, similar spots on the costa, one before the tip of the 1st longitudinal vein and the other before the uppermost branch of the 2nd longitudinal vein. The underside of the wing in certain lights shows a bright iridescence, due to numerous, scattered, small scales of variegated colours.

In all remaining points as in *P. squamipennis*, but a very distinct species.

Length nearly 1 millim.

Described from one female in the Indian Museum collection, taken in Calcutta, 27. viii. 07.

184. **Parabrunettia 9-notata**, *Brun.*

Parabrunettia 9-notata, Brunetti, Rec. Ind. Mus. iv, p. 313 (1911).

♀. Body covered with rich dark brown bristly hairs on thorax, blackish brown on abdomen, with a few white hairs at the tip of the latter. *Head*: antennal scape with dark elongate scales; flagellum with pear-shaped joints and brown verticillate hairs, which appear greyish when viewed in certain directions. Distinct long, curved chætæ present. *Legs* blackish; femora with a considerable number of greyish, elongate, depressed scales; tibiæ and metatarsi with whitish-grey scales at tips; a few scales of a similar nature are also present at the tips of the tarsi. *Wings* with the whole surface as well as the veins covered with blackish hairs, which are much thicker and denser on the costa, where they are prominent and distinctly black; around the remainder of the border of the wing they are dark brown. A very conspicuous spot (on the extreme edge of the wing-border) at the tip of every vein, composed of small white scale-like hairs; a number of white erect hairs on most of the veins in the basal half of the wing. Anterior branch of 2nd longitudinal vein forks opposite the fork of the 4th vein. The pubescence prevents a clear view of the base of the wings, but apparently the 2nd longitudinal vein forks beyond the base of the 3rd vein.

Length $1\frac{1}{3}$ millim.

Described from one female from Puri, Orissa, east coast of

India, 12. xi. 10, taken by Dr. Annandale on a window-pane; the specimen is now in the Indian Museum.

The conspicuous curved chætæ on the flagellum suggest that this species belongs here, and the hairy surface of the wing is a second character of the genus. However, the wing is destitute of scales, except the small ones forming the spots; and the species is placed here provisionally, pending the satisfactory elucidation of this group of forms.

185. **Parabrunettia flavicollis**, *Brun.*

Parabrunettia flavicollis, Brunetti, Rec. Ind. Mus. IV, p. 314 (1911).

♂. *Head*: vertex with bushy yellow bristly hairs; frons and face with black bristly hairs. Antennæ with flask-shaped flagellar joints, long-necked, the brown verticillate hairs widely spread; long S-shaped chætæ distinctly present; scapal joints with scales. *Thorax* with rather bright yellowish hairs with some grey hairs intermixed. *Abdomen* with moderately dark brown hairs. Genital organs with close long bristly hairs, apparently normal in form. *Legs* covered with dark brown scales; some yellowish white bristly hairs on tibiæ, longest on hind pair, which latter are thickened at their tips and bear a circlet there of yellowish grey scales. Tips of anterior tibiæ and tips of all the metatarsi with narrow circlets of yellowish white scales. *Wings* with the 2nd longitudinal vein forking considerably beyond the base of the 3rd. Anterior branch of 2nd vein forking distinctly before the middle of the wing and a little beyond the fork of the 4th vein. Hairs placed only on the veins, not on the surface of the wings. A black hair-spot at tips of the veins and a few stiff yellowish grey hairs at or just before the tips of the veins. A black bristly hair-spot at fork of anterior branch of 2nd longitudinal vein.

Length about $1\frac{1}{3}$ millim.

Described from a single male in the Indian Museum collection, from Peradeniya, Ceylon, taken August 1910.

186. **Parabrunettia longichæta**, *Brun.*

Parabrunettia longichæta, Brunetti, Rec. Ind. Mus. iv, p. 374 (1911).

♂. *Head* with brown hairs. Palpi dark brown. Antennæ generally as in *Psychoda bengalensis*; the verticels of hairs widely spread out, light brown; the chætæ very long and conspicuous, although pale, S-shaped. *Thorax* with dark ground-colour and yellowish bristly hairs. *Abdomen* with dark ground-colour with light brownish-grey hairs. Genitalia large and distinct, very pubescent. *Legs* light brown, with concolorous scales and bristles, also whitish scales on knees and on bases of tibiæ, on tips of tibiæ and of metatarsi, and very minute yellowish-white scales on the tips of the remaining joints. Femora and tibiæ with short stiff black hairs here and there. *Wings* (rather rubbed) with hairs on

surface only; light brown or greyish, with small patches of light erect hairs irregularly disposed. The 2nd longitudinal vein forks distinctly beyond the base of the 3rd vein, the anterior branch forking a little beyond the fork of the 4th vein, both very near the middle of the wing.

Length $1\frac{1}{2}$ millim.

Described from a single male in the Indian Museum, taken by Dr. Annandale at Maddathorai, Travancore State, South India, 17. xi. 08.

Referred doubtfully and provisionally to the present genus. There being no hairs on the surface of the wings, and no scales, it is questionable whether a new genus should not be erected for it.

Family DIXIDÆ.

Body moderately slender and of moderate size. The head rounded; the eyes dichoptic, bare. Proboscis short, the continuation of a slightly produced snout; palpi four-jointed, of average size. Antennæ probably of about 16 joints, the exact number unknown owing to the hair-like nature of the end of the flagellum, rendering exact discrimination impossible. There is a distinct

Fig. 37.—Diagrammatic lateral view of a *Dixa*; *a*, antenna.

scape consisting of the two basal joints, of which the first is sometimes very small; the second is large, rounded, much larger than the base of the flagellum. Neck hardly prominent, the head set rather closely on the thorax. Thorax oval elongate, arched. No transverse suture. Abdomen linear, subcylindrical. The whole body very sparsely provided with hairs, most of the thorax being bare. Legs rather long, slender, microscopically pubescent; coxæ

rather elongate; tibiæ without spurs. Wings comparatively broad and large, bare of hairs, veins very distinct. No discal cell; four posterior cells; the 2nd longitudinal vein forked, the costa not terminating at the wing-tip.

The venation is fully described under the generic description of *Dixa*, the only genus of the family.

The *habitat* of the DIXIDÆ is moist places in woods, or near the mountain-streams in which the larvæ live. Winnertz records seeing them in considerable numbers performing aërial dances.

The peculiar venation of this family, added to the very filiform nature of the antennæ, so that exact discrimination of the joints is impossible, renders the members of it at once recognisable; and by these characters taken together it is at once separated from all other families in the whole of the Diptera.

Genus DIXA, *Mg.*

Dixa, Meigen, Syst. Beschr. i, p. 216 (1818).

GENOTYPE, *Dixa maculata*, Mg.

Head somewhat rounded. Eyes round, frons wide, eyes contiguous or sub-contiguous below; no ocelli. Proboscis at the end of a short snout, distinct but not conspicuous. Palpi of four joints. Antennæ with the two scapal joints much larger than those of the flagellum, the basal one sometimes so short as to be easily overlooked. Flagellum of an uncertain number of joints, being so fragile and hair-like towards its tip that it is impossible to distinguish the exact number.* *Thorax* highly arched, sub-gibbous in some species. No transverse suture. Scutellum transverse, metanotum arched. *Abdomen* moderately long, of seven or eight segments, linear, shortly pubescent. Genitalia of male of moderate size, distinct, somewhat clubbed. In the female the abdomen is slightly widened before the tip, the ovipositor shortly pointed. *Legs* long and slender; coxæ rather elongate; tibiæ without spurs at the tip. *Wings* comparatively large and broad. The auxiliary vein ends just before the middle of the wing; *the 1st longitudinal vein runs close to and parallel with the costa, following it round the wing nearly to the apex.* The 2nd longitudinal vein begins beyond the middle of the wing at a very wide angle, the first part of the præfurca being perfectly straight and moderately long; it then takes at an acute angle a wide upward sweep, this second section being longer than the first; the vein then forks, the veinlets converging together towards the wing-tip. The 3rd vein

* In the five Oriental species herein treated of, at least twelve joints are visible (without counting the apical portion of the flagellum), all minutely but very closely pubescent, so that I shall expect the exact number ultimately to prove to be fourteen.

begins at the angle in the præfurca, almost immediately turning outwards and running straight to the wing-tip. Anterior cross-vein short, placed just at the bend of the 3rd vein. The 4th vein forks just beyond the anterior cross-vein, the upper branch forking again near its tip, the lower branch straight, simple. Basal side of 3rd posterior cell rectangular; *discal cell absent*; posterior cross-vein just beyond the base of the 3rd posterior cell. Four posterior cells. The 6th vein nearly straight, *the 7th vein absent, or at least abortive*, as there is a faint trace of a very short vein at the extreme base of the hind angle of the wing. The venation is remarkably consistent in all the Indian species.

Range. Europe, Morocco, Asia Minor, Siberia, Himalayas, China, North America and the West Indies.

So long ago as 1714 Réaumur described the larva of *Dixa*,* and De Geer † later on redescribed it, adding much further information.

Staeger has described the life-history (Réaumur's description was of the larva only and not of the transformations) of a species from Denmark, *D. nigra.* ‡ The transformations of several European species are described by Meinert. §

The larva of *Dixa* has a habit of resting with its body in the form of a siphon, that is to say, with its head and tail drawn up close together, the intervening portion of its body curved into a loop, the top of the loop being a little anterior to the middle of the body; in other words, the bend does not occur half-way between the extremities, but at the fifth and sixth segments behind the head. The head has great flexibility, as it can be bent round parallel to the rest of the body. It is hard, with a pair of branched antennæ and elongate, palp-like appendages about the mouth. There are eleven segments to the body in addition to the head, the ultimate segments bearing the caudal appendages, consisting of an elongate-conical central piece which ends in three filaments, and two slender flexible hairy side-pieces. The locomotive organs (pseudopods or prolegs) are ventral, and not dorsal as has been stated by both Réaumur and De Geer. They are armed with hooks, and are placed on the fourth and fifth segments. On the eighth, ninth, and tenth segments are bunches of setæ which fulfil the office of legs, and were mistaken for such by Réaumur. In some species the dorsal surfaces of six of the segments (the fifth to the tenth inclusive) bear oval shields fringed with setæ. In other species this character is absent.

The larva grows to a length of less than half-an-inch. It is found in pools overgrown with vegetation, resting on leaves just above the surface of the water, and remains with its head and tail close to the water's edge. If removed from the water it soon dies

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* Mém. de l'Acad. Roy. de Paris.
† Mém. Hist. Ins. vi, p. 380 (1776).
‡ Naturh. Tidsskr. iv, p. 202 (1842).
§ K. Danske Vid. Selsk. Skrift. iii, p. 452 (1886).

and if detached forcibly and plunged into deeper water it swims energetically, but in an erratic course, to regain as near as possible its original position. Its food is microscopic.

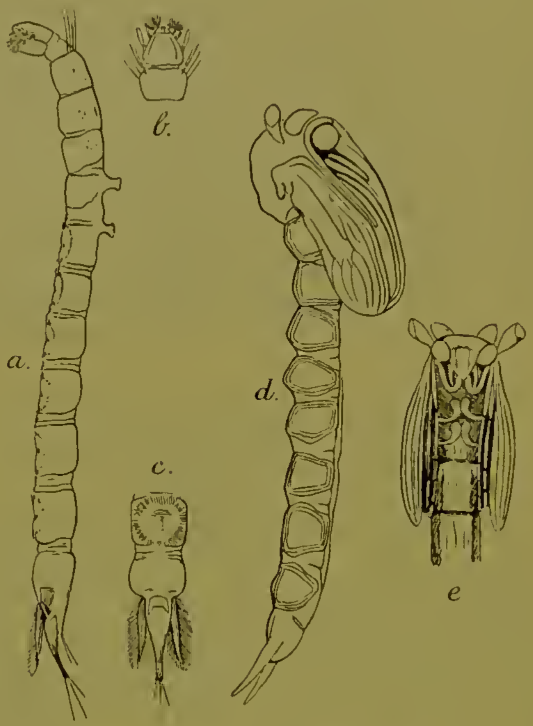

Fig. 38.—Early stages of *Dixa*: *a*, lateral view of larva; *b*, anterior segments of larva, dorsal view; *c*, terminal segments of larva, dorsal view; *d*, lateral view of pupa; *e*, anterior half of pupa, ventral view (after Miall).

The pupa of *Dixa* is black and inconspicuous, apparently without power of voluntary motion, lying resting in a vertical position at the surface of still water, or surrounded by decaying vegetation near the shore. It has a large elongate respiratory organ on each side of the head; the body is long and larva-like, terminated by two moderately long pointed processes.

Table of Species.

1.	Wing with more markings than a narrow transverse streak across the middle	2.
	Wing with only a narrow transverse streak across the middle. Thoracic stripes dark brown; abdomen blackish.	4.
2.	Wing-tip distinctly infuscated for a little distance. Thoracic stripes brownish yellow; abdomen brownish yellow	*ochrilineata*, Brun., p. 261.

Wing-tip not infuscated. Thoracic stripes dark brown, abdomen brown . . 3.
3. Wing nearly clear; only a few infuscated spots, mostly in basal and anal cells; no deeper black spots . . . . *montana*, Brun., p. 262.
Wing with several blackish streaks; and four rather deep black marks contiguous to and below the 1st longitudinal vein . . . . *maculipennis*, Brun., p. 263.
4. The transverse streak on the wing extending over the posterior cross-vein . *bistriata*, Brun., p. 264.
The transverse streak not continued over the cross-vein . . . . *bifasciata*, Brun.,* p. 264.

187. **Dixa ochrilineata**, *Brun.*

Dixa ochrilineata, Brunetti, Rec. Ind. Mus. iv, p. 267 (1911).

♀. *Head* light yellow. Eyes separated by a frons one-third the width of the head. Proboscis yellowish, with rather well-developed terminal dark brown lips; palpi dark brown. Antennæ: 1st scapal joint very short and indistinct, 2nd large, globular, yellow; flagellum of 14 to 16 joints (?), dark brown, extreme base of first joint yellow. *Thorax* distinctly gibbous, prominent in front, yellow. Three brownish yellow dorsal stripes, somewhat normally placed, the median one attaining the anterior margin, the outer ones distinctly curved towards and over the sides anteriorly. Some soft long hairs in the neighbourhood of the stripes and in front of the wings. Scutellum and metanotum yellow, the former a little brown at the sides, the latter in the middle. Sides of thorax with a dark brown lateral stripe on a level with and passing across the bases of the coxæ. *Abdomen* brownish yellow, a little darker towards the sides. Ovipositor small, inconspicuous, pale yellow. *Legs*: coxæ and femora pale brownish yellow, femora a little lighter near the tips, the tips themselves with a blackish brown ring; tibiæ and tarsi brownish. *Wings* very pale grey, costal cell wholly unmarked; tip of wing very pale blackish from beyond the fork of the 2nd vein, the shade extending posteriorly as far as the 2nd posterior cell and filling it; a dark brown streak from the 1st longitudinal vein, passing over the origin of the 3rd vein, the anterior cross-vein, then in diminished intensity to the hind margin of the wing by way of the posterior cross-vein and the last section of the 5th longitudinal vein; a very pale blackish spot in the 1st basal cell, near its tip, an elongate one in the basal part of the 2nd basal cell, turning down at its proximal end into the anal cell. Wings a little yellowish at the base. Halteres pale yellow.

Length 2 millim.

Described from a female from Kurseong, 9. ix. 09 (*Annandale*).

Type in the Indian Museum.

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* *D. bifasciata* is possibly the female of *D. bistriata*.

188. **Dixa montana**, *Brun.*

Dixa montana, Brunetti, Rec. Ind. Mus. iv, p. 265 (1911).

♂ ♀. *Head*: frons and back of head lighter or darker grey. Proboscis robust at base, pointed, moderately long, pubescent, brownish yellow; palpi dark brown. Antennæ: 1st joint large, globular, yellowish brown; flagellum apparently of twelve joints, brownish yellow, closely pubescent, filamentous towards the tip, making it difficult to discover the exact number of joints. *Thorax*: dorsum grey, sometimes a little yellowish, sometimes almost whitish. Three dark brown stripes, the median one, which is very narrowly divided more or less by a longitudinal pale stripe, runs from the anterior margin to beyond the middle, posterior to which it continues, much narrowed. The two outer stripes which are separated from the median one by a narrow space, begin some distance behind the shoulder and continue to the posterior margin of the dorsum; the space between them, posterior to the broad part of the median dark stripe, being light grey, traversed longitudinally by the attenuated continuation of the median stripe. A more or less indistinct transverse streak, or darker space, on the shoulders, brown or grey, of a lighter or darker shade, sometimes with traces of a thin line connecting them. Scutellum yellow; metanotum brownish. Sides of thorax brownish or brownish grey, irregularly tinted. *Abdomen* dark brown, with very sparse pale hairs. Genitalia of male very small, yellowish, mainly concealed; the tips of (presumably) a pair of small claspers are visible. Ovipositor of female small, with a reddish-brown tip. *Legs* pale brownish yellow; tips of femora and tibiæ, and the tarsi towards the tips, blackish; the hind tibiæ being very distinctly though not greatly incrassated. *Wings* pale grey, with three moderately small pale brown spots. The first embraces the end of the præfurca, the base of the fork of the 2nd vein, and the anterior cross-vein; the second spot is in the middle of the basal cell; the third is placed across the middle of the 5th vein, thus falling across both the 2nd basal and the anal cells. A very pale grey, irregular, narrow, but distinctly perceptible streak joins the fork of the 2nd vein to the fork of the 4th. In addition there are some indistinct pale grey spots placed apparently irregularly in the basal half of the wing. Halteres yellowish.

Length 2–3 millim.

Described from three males and two females in the Indian Museum collection, all captured by Dr. Annandale in the Simla district, with the following data:—Simla, 7000 ft., 10. v. 09 (*type* male); Barogh, 5000 ft., 10. v. 10; Phagu, 9000 ft., 11. v. 09 (*type* female).

This species must bear some resemblance to the common European *D. maculata*, Mg. Of the descriptions available to me that of this species is the only one in which the slight but very distinct incrassation of the hind tibiæ is mentioned. Yet this

character, although distinctly present in all five Oriental species treated of here, and apparently common to both sexes, has not, so far as I am aware, been described as generic.

In the European species, *D. maculata*, the thorax is described as pale yellow, and there are stripes on the sides of the thorax, the base of the wing is yellowish, and lesser differences also are apparent between Meigen's species and the present one, which may be regarded as distinct.

189. Dixa maculipennis, *Brun.*

Dixa maculipennis, Brunetti, Rec. Ind. Mus. iv, p. 266 (1911).

♂ ♀. *Head*: back of head, vertex, and frons light grey. Proboscis yellowish, distinctly dark brown at base; palpi dark brown. Antennæ with two very distinct basal (scapal) joints, the 1st circular, very short, the 2nd subglobular, both orange-yellow; flagellum of at least fourteen joints, possibly one or two more, as they are not at all easily counted. *Thorax* rather bright yellowish. Three dark brown thoracic stripes as in the previous species; and on each shoulder a distinct but not sharply defined brownish curved transverse streak, connecting the tip of the median stripe with the tip of the outer stripe. Prothorax forming a sort of imperfect collar, swollen on each side into an elongate lobe, lying close to the thorax. Scutellum dark brown, with a broad yellow median indistinct stripe; metanotum dark brown. A small brown scutellar bridge with a narrow yellow upper margin joins the scutellum on each side to the wing-base. *Abdomen* brownish, a small blackish mark towards each side on the posterior margins, the segments becoming blackish towards the tip of the abdomen. Genitalia of male black; a pair of large, conical, fleshy claspers, the 1st joint of which is yellowish; the 2nd joint is also conical, smaller, apparently pointed at the tip. (The claspers are closed, so that the tips are not clearly visible.) Ovipositor blackish. *Legs* pale yellowish; tips of femora and tibiæ, and the tarsi towards the tips, narrowly black; hind tibiæ slightly but distinctly incrassated at tips. *Wings* pale grey, costal cell unmarked, the brown spots beginning on the 1st longitudinal vein. Four distinct brown spots in a row, with fairly clearly cut sides, are placed in juxtaposition to this vein:—the first small, rounded, near the base; the second larger, squarish, below the tip of the auxiliary vein, both these two spots limited posteriorly by the 4th vein; the third spot is a streak, beginning beyond the origin of the 2nd vein, and ending on the 4th vein, before the anterior cross-vein; the fourth spot is over the fork of the 2nd vein. Much lighter pale brownish-grey small spots are placed, possibly irregularly, over the rest of the wing. In the single specimen present they are situated as follows:—two in the 2nd basal cell, two in the anal cell, one in the axillary cell; one each in the marginal, submarginal, and the 1st posterior cells, all united more or less into a streak, placed

towards the tip of the wing. Two each in the basal (one basal, one central) and 2nd submarginal cells, also in the 1st posterior cell; one each at the base of the 3rd, 4th, and 5th posterior cells. Halteres yellowish.

Length 2–2¼ millim.

Described from one male and one female, the male from Darjiling, 29. v. 10 (*Brunetti*), the female from Matiana, 8000 ft., Simla district, 28–30. iv. 07 (*Annandale*).

Types in the Indian Museum.

Easily known by its marmorated wings.

190. Dixa bistriata, *Brun.*

Dixa bistriata, Brunetti, Rec. Ind. Mus. iv, p. 268 (1911).

♂. *Head*: proboscis and palpi brownish yellow, the former brown at the tip. Antennæ: 1st scapal joint very wide and short, saucer-like, 2nd normal, subglobular; flagellum of not less than twelve joints, closely pubescent; the whole antennæ dark brown, except the pale yellow extreme base of the 1st flagellar joint. *Thorax* pale yellowish. Three dark chocolate-brown stripes of normal pattern, the median one extending somewhat linearly in front just below the shoulders; the shoulders themselves with a very pale blackish streak. Scutellum and metanotum dark brown, a narrow yellowish stripe in the middle of the former. Sides of thorax yellowish, with brown marks. *Abdomen* blackish, with a little pale yellow pubescence. Genitalia of moderate size, consisting of a pair of dark brown claspers, of which the 2nd joint is cylindrical, much thinner, yellow; apparently a small dorsal plate is present in addition to the moderately large ventral one. *Legs* pale brownish yellow, tips of femora and tibiæ narrowly black-ringed; tarsi darker. *Wings* practically clear, a blackish narrow irregular streak in the middle from the 1st longitudinal vein, over the cross-veins, continued in an attenuated form along the posterior cross-vein and the terminal section of the 5th longitudinal vein. A very pale blackish streak in the basal part of the anal cell. Halteres yellow.

Length 2½ millim.

Described from a single male taken by myself at Darjiling, 29. v. 10.

Type in the Indian Museum.

191. Dixa bifasciata, *Brun.*

Dixa bifasciata, Brunetti, Rec. Ind. Mus. iv, p. 269 (1911).

♀. *Head*: the broad flat vertex dusted with light grey, through which the dark ground-colour can be seen. Proboscis yellowish brown; palpi long, concolorous. Antennæ with its two scapal joints very distinct, dark brown; flagellum brown, except the pale yellow extreme base of the first joint. *Thorax* pale yellowish.

Three dark brown stripes of normal pattern, the outer ones continued much further forward than in the last species; dorsum between the stripes greyish. Scutellum yellowish; metanotum dark brown. Sides of thorax yellowish, with brown markings. *Abdomen* blackish, with whitish pubescence; belly similar. *Legs* pale yellowish, knees almost imperceptibly black, tarsi darker; hind tibiæ with the slight incrassation at the tip as usual, but yellowish. *Wings* very pale grey, a rather dark brown narrow short streak in the centre over the cross-veins, not extending to the posterior cross-vein. A pale blackish streak filling the basal half of the anal cell. Halteres pale yellow.

Length nearly 3 millim.

Described from a single female taken by Dr. Annandale at Phagu, 9000 ft., in the Simla district, 12. v. 09.

Type in the Indian Museum.

This species is very near *D. bistriata*, and may possibly be identical with it. The differences lie in the respective lengths of the 1st scapal joint and in the lengths of the thoracic stripes; while the tips of the femora and tibiæ are black-ringed in one species and practically all yellow in the other. The wing markings in the two species may be differentiated as follows:—In *bifasciata* the central streak stops before or at the posterior cross-vein, this vein itself not being at all suffused, whilst in *bistriata* the suffusion is continued narrowly to the posterior margin. The basal pale streak in the anal cell is much more distinct in *bifasciata* than in *bistriata*. When placed side by side the two forms appear distinct, although the descriptions may appear very similar.

Family TIPULIDÆ.

The members of this family are almost too well known to need much description. In England they are generally known as "daddy-long-legs," and in America as "crane-flies."

The principal characters of the TIPULIDÆ, as enunciated by Baron Osten Sacken, are:—(1) the presence of the V-shaped dorsal suture transversely across the mesonotum;* (2) the extent and completeness of the venation; and (3) the structure of the ovipositor in the female; these three characters being practically constant throughout the whole family.

* In the subfamily PTYCHOPTERINÆ, the V-shaped or "transverse" suture is indistinct (possibly absent in some cases), but the species are comparatively few in number and always essentially tipulidiform in character, so that their relegation to this family is fairly obvious at first sight. This suture is present in no other family of the NEMATOCERA, except in incomplete form in some BLEPHAROCERIDÆ.

The principal features of the venation are the great length of the auxiliary vein and of the two basal cells, the development of the latter throwing the distal and posterior veins mainly into the apical part of the wing; also of the presence, normally, of a discal cell, which, with the sole exception of the RHYPHIDÆ, is absent in all the other families of this suborder. The veins in their ultimate subdivisions along the margin of the wings are usually ten to twelve in number, rarely nine (*Toxorhina*). One genus (*Chionea*) is wingless.

For the last half century or more, the TIPULIDÆ have always been divided into three subfamilies, designated respectively the PTYCHOPTERINÆ, TIPULINÆ, and LIMNOBIINÆ. *Dixa*, as a subfamily DIXINÆ, has been included by one or two authors, even as late as 1888 by Verrall, and placed next to the PTYCHOPTERINÆ, and *Chionea* has been included by some and withdrawn by others.* Schiner placed *Dixa* with a few other genera (*Blepharocera*, Macq., *Macropeza*, Mg., *Spodius*, Lw., *Pachyneura*, Zett., *Corynocera*, Zett., and *Orphnephila*, Hal.) which he considered anomalous, at the end of the NEMATOCERA. *Chionea* he included in the TIPULIDÆ as an anomalous genus, separating it from the three subfamilies quoted above.

These subfamilies have been almost universally recognised until comparatively recently, when several authors have regarded them as separate families, *Dixa* also forming another family. Whether they should rank as families or not, it seems to me that they should be at least placed in juxtaposition in a systematic sequence of families. They are, however, to me so essentially similar in structure and general resemblance, that it seems imperative to include them again under one family name.

It is impossible to assume that there is as much distinction between the PTYCHOPTERINÆ and even the rest of the TIPULIDÆ combined, as there is between it and any other family of NEMATOCERA, say, CULICIDÆ or CHIRONOMIDÆ. There is therefore still less difference, from a "family rank" point of view, between the TIPULINÆ and the LIMNOBIINÆ. In spite of the admitted tendency of present-day zoologists to multiply families, genera and even higher ranks, I see, personally, in the whole of the order Diptera, no legitimate grounds for the creation of any new families.†

The TIPULIDÆ, as a whole, have always appealed to me as a peculiarly homogeneous family with quite well-defined limits, with the sole exception of *Dixa*, a genus, however, that is more nearly allied to the TIPULIDÆ than to any other family.

In the recent Catalogue of Palæarctic Diptera, by Kertész, the PTYCHOPTERINÆ, raised to family rank, with the DIXIDÆ and

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* This genus is now definitely recognised as belonging to the TIPULIDÆ.

† *Vide* "Taxonomic values in CULICIDÆ," in Rec. Ind. Mus. iv, p. 53 (1911), in which I deprecate the multiplication of genera and species in this family.

Blepharoceridæ, are placed between the Culicidæ and Simuliidæ, with several other families between them and their natural allies the Tipulinæ and Limnobiinæ, both of which are treated in that catalogue as distinct families, Cylindrotomidæ (as a family also) following them.

The Dixidæ and Rhyphidæ are undoubtedly the most closely allied families to the Tipulidæ.

The Dixidæ are distinguished from them by the absence of the discal cell and the absence of the transverse thoracic suture. The venation, though bearing a closer resemblance to that of some Ptychopterinæ than to that of any other family, possesses a system of its own, which a glance at the diagrams of wings will at once show.* The filiform antenna, in which it is impossible to discriminate the individual joints of the apical portion, is different from anything existing in Tipulidæ, except in *Trichocera*.

The Rhyphidæ possess a link with the bulk of the Tipulidæ in the presence of a discal cell, which is absent throughout the rest of the Nematocera. Their general structure and appearance (as also those of the Dixidæ) are similar to those of the Tipulidæ, but they are distinguished by the contiguous eyes in the male, in conjunction with the absence of the transverse suture on the mesonotum.

Head. In the large majority of the genera of Tipulidæ the head is transverse, sometimes elongate, and rarely subglobular; the head itself, apart from the proboscis, being referred to in this case; mostly bare, or nearly so, conspicuous bristles or spines being absent, except that in some of the largest species the hairs in places, such as the end of the proboscis, may be long and stiff, but hardly worthy of being called bristles in the chætotactic sense. Short stiff bristly hairs are prevalent on the basal joints of the antennæ in many species, but they are never conspicuous, nor of sufficient importance to be of much value in the classification of species. No conspicuous beard is ever present; the frons, vertex and back of the head bear short hairs, which in some species of Eriopterini become comparatively long and shaggy.

The *eyes* are rounded or oval, never or hardly ever excised or cut away on the inner side above, giving a reniform (kidney-shaped) appearance to these organs, as is the case with many Culicidæ, Chironomidæ, Psychodidæ, Simuliidæ, and some Mycetophilidæ. The eyes are almost always separated on the upperside of the head by a broad frons, generally from one-third to three-fourths of the entire width of the head; the frons being of equal width in both sexes or only slightly wider in the female. On the underside of the head, the eyes are nearly always contiguous or subcontiguous. It has been my good fortune to

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* Compare *Dixa* (Pl. XII) and *Ptychoptera* (fig. 39, p. 275).

discover amongst the rich material of this family in the Indian Museum, a genus with absolutely contiguous eyes in both sexes, the first recorded instance in the family,* so far as I am aware. Throughout the TIPULIDÆ the eyes, as an almost inviolate rule, are quite glabrous or bare, with the exception of one section of the LIMNOBIINÆ (AMALOPINI), in which they are closely but shortly pubescent.

The *proboscis*. The front of the head is practically always prolonged forward into a sort of snout of greater or less proportion; this is spoken of by many authors (especially the older ones), under the general term of *proboscis* or *rostrum*. It varies considerably in the TIPULIDÆ, as indeed it does in most families. In extreme cases it is very slender, and one and a half times the full length of the body (*Elephantomyia*). In many genera it is considerably elongated, stiff and conspicuous (*Geranomyia*, *Rhamphidia*, *Toxorhina*); in the great majority of genera it is of moderate length, being somewhat longer than broad. In the TIPULINÆ (or TIPULIDÆ LONGIPALPI), the rostrum is generally more prolonged than in the LIMNOBIINÆ (or TIPULIDÆ BREVIPALPI), and its upper part projects at the tip somewhat over the lower portion in the shape of a point, generally hairy. This is known as the *nasus*, and is peculiar to the TIPULINÆ, being rarely absent in this subfamily. The upper part or covering of the rostrum or proboscis was recognised by Osten Sacken as the *epistome*, which term he always employed when desirous of speaking of it as a separate piece, apart from the whole prolongation of the head regarded as a single organ.†

The proboscis proper lies underneath this upper lip, epistome or *labrum*, and represents the lower lip or *labium*; it is generally longer than the upper lip, projecting from below at its end, and bearing a fleshy labellum on each side; these latter are sometimes considerably developed and are usually pubescent; often they are inconspicuous. Between the epistome and the proboscis is a linear pointed organ, the *tongue* or *lingua*, which reaches its greatest development, so far as the Indian species go, in *Geranomyia*. In *Elephantomyia* ‡ it is still longer, but whether it is more complex remains uncertain.

Osten Sacken's description of the oral parts of *Geranomyia* is as follows:—" These consist of a very long subcylindrical epistoma, a still longer lingua, which is slender and pointed, and a labium divided into two branches at the tip, terminated by slender

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* This genus is named *Ceratostephanus*, belonging to the LIMNOBIINI section of the LIMNOBIINÆ, and is further accentuated in abnormality by the presence of two elongate processes attached to each joint of the antennæ.

† In the present work I have employed the comprehensive term proboscis for the whole prolongation of the head, as, without dissection, it is rarely possible to differentiate the parts of the mouth. When referring specially to the *nasus* in TIPULINÆ, that term is employed.

‡ Oriental, but not yet recorded from India.

flattened lobes; these branches are divergent, and sometimes curled up in dried specimens. The short palpi (bi-articulate, according to Mr. Curtis) are inserted about the middle of the proboscis to the anterior angles of the rostrum."

The mouth parts, it is probable, do not attain in this family any higher complexity than that herein described, in fact it seems probable that in many genera the organ is of much more simple form. Meigen speaks of a pair of horny linear pointed maxillæ in *Glochina*, a non-Oriental genus which I have had no opportunity of examining.

The *palpi*. These organs are, in the large majority of genera, four-jointed, and afford useful characters for subdividing the family. The following table indicates how these organs differ in the various subfamilies.

The four palpal joints all considerably elongated ..	PTYCHOPTERINÆ.
The first three palpal joints moderately elongate only, the 4th always at least as long as the 2nd and 3rd joints together.	
The 4th palpal joint very long, whiplash-like, generally as long as or longer than the three preceding joints taken together............	TIPULINÆ.
The 4th palpal joint of about the length of the 2nd and 3rd taken together, or only a little longer than this, generally not whiplash-like	LIMNOBIINÆ.

In the TIPULINÆ the palpi are generally of more or less uniform thickness throughout, the last joint being often rather more slender; but in the LIMNOBIINÆ this comparative uniformity is not perceived, the 2nd joint frequently being much stouter altogether than the rest, the whole palpus generally being incurved, or bent approximately into a circle, often making it difficult to decipher the limits of each joint. The longer and whiplash-like (generally curved or twisted) nature of the 4th palpal joint in the TIPULINÆ is easily recognisable after a little practice.

The *antennæ* are always elongate, often exceptionally so, reaching, if bent backwards, to about the root of the wings. The number of the joints varies, the two basal joints, forming the scape, being invariably differentiated from the remainder, which are called collectively the flagellum, these generally being all alike except that the first or basal one is sometimes slightly different, although never to such an extent as the scapal joints. The terminal joint may be reduced almost to a short style and is often easily overlooked. In the subfamily PTYCHOPTERINÆ the antennæ are 16-jointed (sometimes expressed 2 + 14). In the TIPULINÆ they are 13-jointed; whilst in the LIMNOBIINÆ they are 14-jointed in the LIMNOBIINI and 16-jointed in the CYLINDROTOMINI, ERIOPTERINI, AMALOPINI (normally) and LIMNOPHILINI. The ANISOMERINI form a somewhat abnormal section, with antennæ of from 6 to 10 joints. Exceptions occur in most of the sections: *Toxorhina*

(RHAMPHIDIINI) with 12 joints, *Rhapidolabis** and *Dicranota* with 13 joints, *Ula* with 17 (all AMALOPINI), and so on.

The joints of the flagellum are usually well separated from one another, sufficiently so as to be tolerably easily counted in most instances with the aid of an ordinary microscope in the case of quite small species, and by means of an ordinarily powerful entomological hand-lens in the case of the larger species. In one genus (*Trichocera*) the joints are, however, so coalescent towards the tip of the antennæ that it is quite impossible to state their number with absolute certainty.†

Verticillate antennæ are the most common form, that is to say, possessing a circlet of long isolated hairs on each joint, perhaps four to six (four is a very general number, arranged two on the upper and two on the lower side); these are in addition to the close microscopic pubescence with which practically every antenna is covered, and which itself varies in length and abundance in different species. The verticillate row may be placed at the base of the joint or towards its centre, and these hairs occur only on the flagellum, never on the scape, which generally bears a few short stiff bristly hairs irregularly placed or arranged in one or two rows towards the tip of each joint.

The feathery (or plumose) antennæ, so common in the males of CULICIDÆ and CHIRONOMIDÆ, are absolutely unknown in the TIPULIDÆ. In some genera, *Ctenophora*, *Pselliophora* and their allies, are found very conspicuous and enlarged pectinate and subpectinate antennæ in the males, in some instances taking very extraordinary forms. *Pselliophora* is the most extensive genus of this nature occurring in the East, whilst a genus of LIMNOBIINI that I have recently described (*Ceratostephanus*) possesses a pair of palp-like appendages to each antennal joint. *Gynoplistia*, Wlk., although not Indian, has antennæ of a similar fanciful shape, whilst other foreign genera have these organs still more abnormally formed.

THORAX. Oval, always longer than broad; occasionally what might be termed "diamond-shaped with rounded angles" (*Orimarga*, for instance), being narrowed both in front and behind; sometimes highly arched (*Teucholabis*) or distinctly gibbous, or actually prolonged over the neck (*Conosia*). In some genera the anterior portion is elongated sufficiently to form a distinct neck (*Teucholabis*, *Orimarga*, *Rhamphidia*); in others this neck is short and inconspicuous. In some cases the head is set closely on the

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* The two new species placed in *Rhaphidolabis*, described herein, have 15 distinct joints; possibly it may be necessary to remove them to a new genus.

† *Dixa*, although it belongs to a different family, is another instance of the same peculiarity, the antennæ dwindling away at the tip almost to the size of a thick hair. When they are of this nature they may truly be called setaceous, though the term is often used to designate any antenna that diminishes to a fine point, even though the joints can be counted with certainty. Used in this latter sense it would apply generally to the bulk of the TIPULIDÆ.

thorax. The prothorax is generally reduced to a more or less disc-shaped piece, conspicuously separated from the mesothorax by a narrow groove. This piece was called the *collare* by Osten Sacken, and though a better name could not be found for it, at all events in this family, but few authors have adopted it, and in the present volume it is sometimes spoken of by that name, sometimes (when least distinct) as the prothorax.

The mesothorax bears the characteristic V-shaped suture running transversely across its middle. This is always present, but in some cases, specific or individual, it is rather less obvious, whilst its indistinctness in the PTYCHOPTERINÆ is one of the characters of that subfamily.

A peculiar feature present in a large number of species is a small indentation, often amounting to a small hole (generally with a small shining black or brown spot at the bottom), placed behind each shoulder, in which region the surface itself is nearly always somewhat sunken. No use has as yet been assigned to them, but Osten Sacken suggested that they might have some connection with the prothoracic spiracles that are placed near and immediately below them. They appear to reach their greatest development in *Limnophila*. Another minor peculiarity is the presence of "two closely approximated shining dots, black or brown, near the point of contact of the intermediate thoracic stripe with the collare." This has been noticed by the present author also in many species.

The whole thorax usually has a bare appearance, as pubescence, except such of microscopic proportions, is mainly confined to a little hair around the base of the wings. There is nothing in the TIPULIDÆ of the nature of *macrochætæ* (or distinct stiff bristles, arranged in some regular manner); but in some genera there is a row on each side of the middle (the rows generally well separated) of rather longer and stiffer hairs than those forming the general pubescence. This is most noticeable in *Erioptera*, of the Oriental genera, the rows (which are composed sometimes of single hairs, sometimes of two or more abreast, irregularly placed) diverging at the suture towards the hind corners of the dorsum.

The *scutellum* is always more or less semicircular and comparatively small, and the *metanotum* in the great majority of genera is conspicuously developed.

ABDOMEN always elongate, considerably longer than the thorax, generally cylindrical, or with the dorsum somewhat flattened; the sides as a rule straight and parallel, except that in the female the abdomen is in many species slightly widened just beyond the middle; the tip in the male usually squarish in shape, clubbed, or only slightly thickened, in the female drawn out conically. There are invariably eight segments, though these are not always obvious; the first generally short, closely and broadly attached to the thorax, the second, especially in *Tipula*, usually the longest, the remainder more or less subequal; the whole abdomen shortly and inconspicuously pubescent.

The upper plate of each abdominal segment is known as the tergite, the lower one as the sternite, the segments being numbered from the base onwards.

The *genitalia* are by some counted as the ninth abdominal segment, but it seems preferable to regard them as appendages. The dorsal and ventral plates of these appendages if fully developed and supplemented by side or pleural plates certainly resemble an abdominal segment, but these are but parts of the genital organs varying in development with the genus and the species. The structure of the genital organs in the male is of the most diverse character, and affords excellent and reliable means of identifying the species. The general plan is the same in all the groups, but the variation in the appendages is very considerable. Normally there is a pair of strong conspicuous claspers * (termed by Osten Sacken the *forceps*) composed of two joints, of which the basal one is large, stout, subcylindrical or conical: the second joint may be single, bifid or trifid; it may be of the same structure as the basal joint or take the form of a coriaceous or horny hook, elongated or blunt, straight, angled or curved; in *Limnophila* two such hooks being present; in *Gonomyia* certain foreign species have a trifid arrangement of the second joint.

When the second joint consists of two pieces they are not of the same consistency, the outer appendage generally being of a more horny nature whilst the inner one is of softer texture. A second pair of inner claspers, or some such organs, are often present, though not easily seen in dried specimens, and a dorsal plate extending below the eighth abdominal tergite is, in most cases, fairly obvious in the more highly developed genera. A ventral plate, sometimes large and V-shaped, extends over the sides of the genital organs, sometimes being reduced to a small curved bottom plate, sometimes in the form of an elongated narrow piece (termed by Osten Sacken the *style*). Side or pleural plates are visible in many genera of Tipulidæ; in others they are reduced to a minimum or apparently absent, perhaps replaced by the V-shaped sides of the ventral plate when this latter takes this form. They vary somewhat in their position, being most typical when lying one on each side of the genital organs, but they may be exserted upon the posterior rim of the segment or may form a small plate set in that rim.

The term *hypopygium* is given to the whole of the male appendages regarded as a single organ; the term *ovipositor* to those of the female. Unfortunately some authors have used the term hypopygium to signify the entire apical enlargement of the male abdomen, which is quite incorrect. "The general shape of the hypopygium in the family Tipulidæ is that of a cup, opening posteriorly. The cavity in the cup is the genital chamber. It is

* The organs can generally be wholly or almost wholly withdrawn within the genital chamber, and in individual cases may be difficult of inspection.

produced simply by the invagination of the posterior face of the segment" (*Snodgrass*).

The intromittent organ, or penis, is attached to the back or dorsal part of the genital chamber in the TIPULINÆ, and arises from the floor of this chamber in the LIMNOBIINÆ. It is very slender and of great length, its tip protected by a piece acting as a guard, the base greatly swollen; this part being known to Dufour, as the *vesicula centralis*.

The *ovipositor* of the female is very much less variable in structure than the male organs of generation, being so remarkably uniform throughout the family as to constitute one of its leading characteristics. The standard form is that of two pairs of elongate, pointed, greatly arcuated or quite straight valves, the upper pair always longer than the lower (except in *Trichocera*), the latter being not only shorter in actual length but set further back. The valves lying as a rule tightly closed, the whole organ appears as an elongated cylindrical termination to the abdomen, and it is in most cases of a reddish, yellowish or brownish colour, or some intermediate shade. The conspicuous nature of the ovipositor differentiates it easily from the two hardly projecting inconspicuous valvules that represent the female genital organs in the other families of nematocerous Diptera.

"The external sexual apparatus of the male consists of a forceps, by means of which the end of the female abdomen is seized from below, a little before the ovipositor, in such a manner that the latter organ is stretched out on the upper part of the abdomen of the male. This done, the male, with a second, inner clutching apparatus, seizes the orifice of the inner genital organs of the female and adjusts thereon for copulation." *

LEGS. Always long and thin, practically always microscopically pubescent, the pubescence being generally visible under slight magnification; in certain genera and species it is conspicuous to the naked eye, but there is no instance of long hairs on the legs, and bristles are also entirely absent throughout the family. The *coxæ* are sometimes lengthened but never unduly enlarged and never to such an extent as in the MYCETOPHILINÆ. The *femora* are often distinctly but slightly thickened at the tip; in the genus *Gymnastes* very considerably so, more so than in any genus known to me. The femora are never dentate as in the Chironomid genus *Ceratopogon*. The *tibiæ* in many groups possess spurs at their tips; in all cases where these spurs occur they are present in all three pairs of legs, often being minute and hidden amongst the rather longer and stiffer hairs that are generally found towards

* Osten Sacken, Monog. N. Amer. Tip. The notes on the genitalia of the North American species in this monograph are very valuable, as, in the introduction to the work, the author states that most of the examinations of these parts were from living specimens, the true form of the organs therefore being observable.

the tip of the tibia.* In many genera they are easily seen. The *tarsi* are always elongate, often being much longer than the tibiæ; the ungues are sometimes smooth, sometimes with teeth on the underside; the empodia are often distinct, sometimes absent, but pulvilli are wanting, except in PTYCHOPTERINÆ.†

WINGS.‡ The costa is continued right round the edge of the wing and not terminated suddenly in the neighbourhood of the wing-tip as in some families of NEMATOCERA (*Mycetophilidæ*, *Chironomidæ*, etc.). The auxiliary vein (or subcostal) is of much greater length than usual, nearly always reaching the middle of the wing and often extending beyond three-fourths of the wing's length. It turns down into the 1st longitudinal vein in the subfamily TIPULINÆ, and up into the costa in the PTYCHOPTERINÆ and LIMNOBIINÆ. In rare cases it is merged with the 1st longitudinal (*Antocha*, *Toxorhina*). The 1st longitudinal is invariably longer than the auxiliary, except, of course, when fused with that vein, in which cases the joint vein is termed the 1st longitudinal; as a rule it ends in the distal third of the wing. The 2nd longitudinal originates from about the middle of the 1st, which is also generally at or near the middle of the wing; it is nearly always forked, the upper branch often being so oblique or perpendicular as to appear like a cross-vein. Rarely the 2nd vein is absent (*Toxorhina*). The 3rd longitudinal is always simple, except in PTYCHOPTERINÆ, and very rarely absent (*Paramongoma* spp.). The 4th longitudinal is invariably forked and at least one of the branches (more frequently the anterior one) forked again. The 4th vein begins at the base of the wing and invariably encloses the discal cell, when such cell is present, as is normally the case. The 5th, 6th, and 7th longitudinal veins normally present, generally straight or slightly curved, the 5th usually bent somewhat downwards at the point where it meets the posterior cross-vein. In the PTYCHOPTERINÆ the 6th vein is absent but the 7th is present. The humeral cross-vein is always present; the subcostal cross-vein generally present in LIMNOBIINÆ, placed at various points

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* In many cases I have been unable to perceive these structures at all in species belonging undeniably to genera theoretically supposed to possess them. Osten Sacken, who was a great believer in their systematic importance, noted that they were often very small and difficult to recognise; but it seems to me that they are more often absent than is generally supposed, and consequently their biological importance is less than has usually been accorded them.

† Too much importance should not be attached to minor differences, such as the comparative size, toothed nature or otherwise, and so on, of the ungues (claws); presence or absence of empodia, etc. When Theobald's first volume on the CULICIDÆ of the world was published, great stress was laid on very microscopic differences in the shape and size of the different pairs of claws, and in my "Catalogue of Oriental Culicidæ" the great value attached to these structures was questioned. In subsequent volumes of Theobald's work it was admitted that they did not possess the value at first accorded them.

‡ As a Tipulid genus (*Limnophila*) was selected for the explanation of the terminology of the venation in Diptera (p. 8), that portion of this work may be studied in conjunction with the present description.

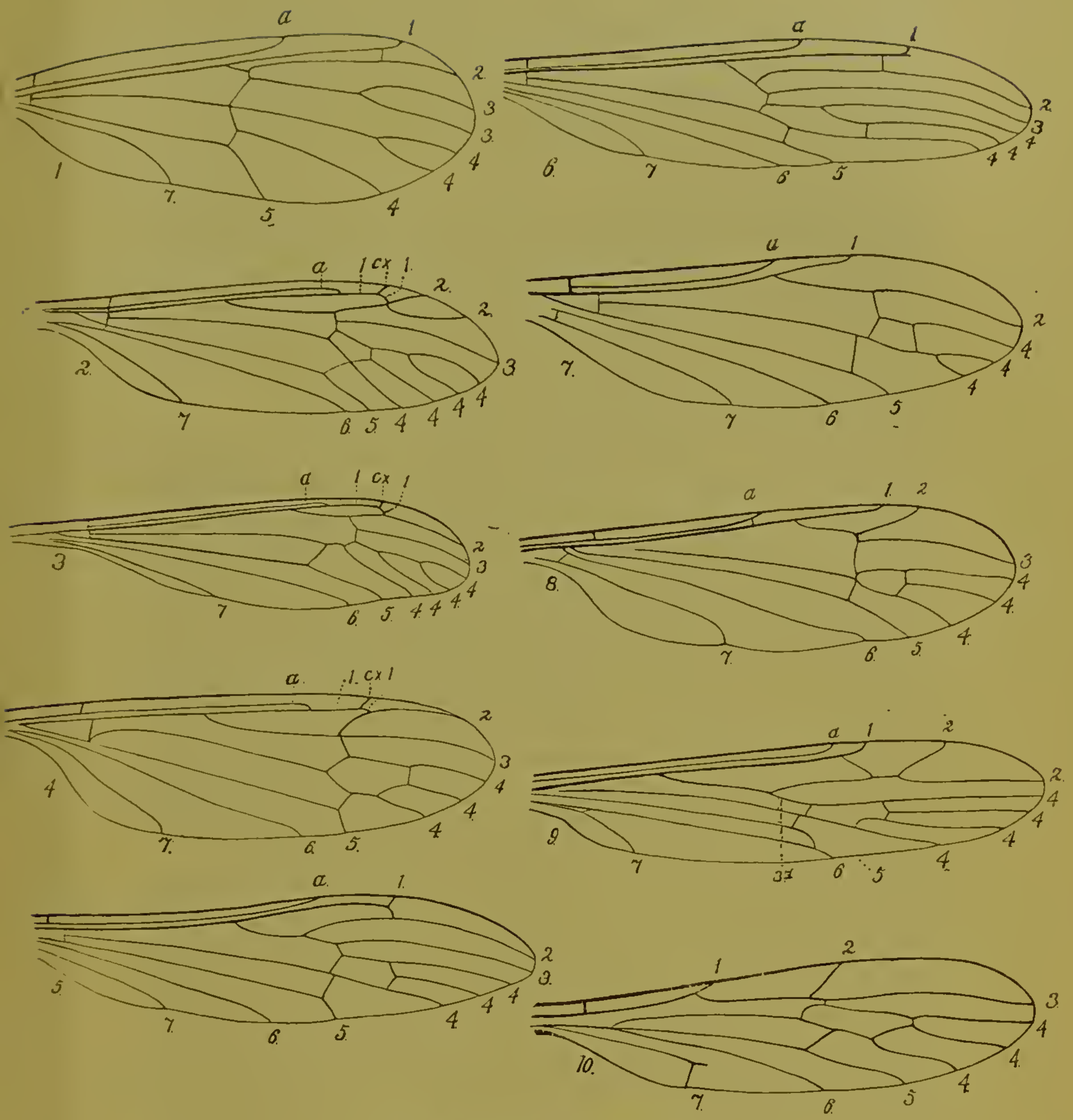

Fig. 39.—Wings of TIPULIDÆ.

1. *Ptychoptera.*
2. *Tipula.*
3. *Dolichopeza.*
4. *Cylindrotoma.*
5. *Limnobia.*
6. *Libnotes.*
7. *Toxorhina.*
8. *Gonomyia.*
9. *Mongoma.*
10. *Styringomyia.*

joining the auxiliary and 1st longitudinal veins; it is absent in PTYCHOPTERINÆ and TIPULINÆ. The marginal cross-vein is absent in TIPULINÆ, present in many genera of LIMNOBIINÆ, but varying in position and intensity, its presence not always constant in the same genus; its value as a generic character must be regarded as comparatively small. The costal cross-vein is a term herein proposed for the small cross-vein joining the costa to the 1st longitudinal nearly at its tip, just before it turns down into the 2nd vein or the anterior branch of the latter. The discal cross-vein is the short veinlet uniting the upper and lower branches of the 4th vein, closing the discal cell and forming its distal side. The anterior cross-vein is nearly always present, being absent in *Mongoma*, and is nearly always placed over the discal cell, when such is present, joining the 3rd and 4th longitudinal veins. Posterior cross-vein always present, joining the 4th and 5th veins, generally at the discal cell or immediately before it.

Marginal and submarginal cells varying in number, but normally one marginal cell (which by the presence of the marginal cross-vein may be divided into outer and inner marginal) and two submarginal cells, due to the forking of the 2nd longitudinal vein. In rare instances there is only one cell, formed by the coalition of the auxiliary with the 1st longitudinal vein, and the total absence of the 2nd vein. This is quite exceptional and exists only in one Oriental genus, *Toxorhina*, the cell being known as the marginal.

Basal cells very elongated, extending practically always beyond middle of wing, thus shortening all the posterior cells. These latter are usually four or five in number, more frequently the former, more rarely six, still more rarely three only.*

Anal angle of wing of various shapes, in some genera distinctly angled, in others cuneiform, as in some species of *Dicranomyia*, for which Skuse has proposed the genus *Thrypticomyia*.†

Life-history. " When the weather is favourable the eggs hatch in little more than a week. The larvæ are ash-grey or brownish, more or less transparent, 12-segmented. The head is incompletely differentiated and retractile, and has the maxillæ and mandibles more or less horny and stout; there are short fleshy antennæ in most larvæ, but they are long and two-jointed in the TIPULINÆ. The organs of locomotion generally consist of transverse swellings on the underside of the body, provided with very minute stiff bristles " (*Williston*).

As a rule the larvæ are terrestrial, living in the earth itself or in decomposing wood or leaves, but a certain number are aquatic. A few resemble the caterpillars of Lepidoptera, not only in appearance, but in their colour and mode of life, living on the leaves of growing plants.

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* *Anisomera* spp., and *Dicranomyia whartoni*, Needham, a North American species.

† This genus probably cannot stand, owing to intermediate forms easily and completely bridging the gap between the more cuneiform-shaped wings and those of normal shape.

"The pupæ, like those of many of the members of this suborder, are free. The thorax has two horn-like processes which represent the thoracic spiracles, one of which may acquire a very great length for the purpose of breathing from the surface while under water. The abdominal segments have transverse rows of hairs, bristles or spines, which enable the pupa to escape from its place of concealment when about to complete its metamorphosis." (*Williston.*)

Some species in the larval state do immense damage to grass and other crops, *Tipula oleracea*, L., being at times a serious pest in meadows in Europe. The life-histories of a number of European species have been worked out, but little or nothing is known of the earlier stages of any Oriental species.

Table of Subfamilies of Tipulidæ.

Mesonotum without distinct V-shaped transverse furrow or suture; 6th longitudinal vein absent; the four palpal joints all considerably elongated, the last one not conspicuously longer than the others; 3rd longitudinal vein forked in *Ptychoptera*	**Ptychopterinæ**, p. 278.
Mesonotum with distinct V-shaped transverse suture always present; 6th and 7th longitudinal veins always present *; the four palpal joints unequally elongated, the last always at least as long as the 2nd and 3rd together; 3rd longitudinal vein never forked.	
The 4th palpal joint very long, whiplash-like, generally as long as or longer than the three preceding joints taken together; auxiliary vein generally turned down at tip into the 1st longitudinal vein; subcostal cross-vein absent; 2nd scapal joint of antennæ short and not wider than the 1st scapal or the 1st flagellar joint; epistome produced at tip into a distinct narrow nasus, or nose	**Tipulinæ**, p. 284.
The 4th palpal joint not conspicuously long, as long as the 2nd and 3rd joints taken together or a little longer; auxiliary vein generally turned up at tip into the costa; subcostal cross-vein nearly always present; 2nd scapal joint generally robust (though short) and broader than both the 1st scapal and 1st flagellar joints; epistome without nasus..........................	**Limnobiinæ**, p. 356.

* In one genus only in Tipulidæ is a wingless form known, *Chionea*, which, however, is not Oriental.

Subfamily PTYCHOPTERINÆ.

Latterly, this subfamily has been elevated by some authors to a distinct family, as in the recently issued "Palæarctic Catalogue" and in the "Catalogue of Diptera" by Kertész, at present in process of issue; but to the writer it seems inseparable from the Tipulidæ.

The Ptychopterinæ form a very compact group, differing in two strong characters from the whole of the rest of the Tipulidæ. These are the indistinctness of the transverse V-shaped suture on the mesonotum, and the absence of the 6th longitudinal vein.*

In *Ptychoptera* itself there can be little doubt of the short curved vein present being the 7th and not the 6th. In *Bittacomorpha* this vein is not so curved, but its position in the wing and distance from the 5th makes it evident that this vein is also the 7th. But in *Idioplasta*, *Macrochile* and *Tanyderus* † the general position of the one vein present behind the 5th, its comparative approximation to the 5th and its usually nearly straight course makes it quite possible that in these three genera the vein present may be the 6th, instead of the 7th. There seems nothing illogical in the 6th being absent in one genus, and the 7th in an allied genus, considering the great abnormality shown by the venation of these three genera. The fact that in the typical and most extensive genus in this subfamily (though in itself comparatively limited in number of species) the vein present is obviously the 7th and not the 6th justifies the assumption, in the absence of stronger evidence to the contrary, that the vein present in the abnormal genera is the 7th also.

The principal genus *Ptychoptera* is further distinguished from practically the whole of the rest of the Tipulidæ by having the 3rd longitudinal vein forked, and this feature, in conjunction with the presence of only one vein behind the 5th, renders the genus easy of recognition. The auxiliary vein in *Ptychoptera* ends in the costa, with no subcostal cross-vein uniting the auxiliary vein with the 1st longitudinal.‡

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* I am convinced by its general position and especially by its habit of turning in suddenly to the wing-margin, that the vein that is present is the 7th and not the 6th, being in this view supported by Osten Sacken and by Schiner (Fauna Austr. ii, p. 495), who both leaned to the same opinion; Williston, usually so correct in the terminology of the venation, being I think incorrect in considering it the 6th. It is therefore the 6th vein which is absent in this subfamily; the 5th is obviously present in its usual place, connected with the 4th by the posterior cross-vein.

† It has been necessary in explaining the above point of view, to mention genera not known from the Orient, but at least one species of *Tanyderus* is Oriental.

‡ In some genera, however, the subcostal cross-vein is present, as, for instance, in *Protoplasta*, *Idioplasta* and *Tanyderus*, its position in these being similar to that in the Limnobiinæ. These genera are not Indian, but *Tanyderus* occurs in Amboina.

In the practical absence of the peculiar fold in the wing which I have elsewhere termed the "obliterative streak," passing from the stigma to beyond the discal cell, the PTYCHOPTERINÆ approach the LIMNOBIINÆ. In possessing sixteen joints to the antennæ, this subfamily also agrees with the LIMNOBIINÆ, but *Ptychoptera* and at least one other genus (*Bittacomorpha*) possess a slight prolongation of the epistoma into something like the nasus of the TIPULINÆ. *Ptychoptera* also rests with its wings divaricate, as do most of the latter subfamily.

The difference in the number of the antennal joints is comparatively unimportant, considering the variation in this character which occurs amongst the LIMNOBIINÆ.

In venation the PTYCHOPTERINÆ show considerable variation. A discal cell is sometimes present (*Idioplasta*, Os. Sac., *Tanyderus*, Phil., *Macrochile*, Lw.), or absent (*Ptychoptera*, Mg., *Bittacomorpha*, Westw.). One genus (*Idioplasta*) has no less than six posterior cells, the normal number in the subfamily, however, being three or four.

Beyond *Ptychoptera* (of which only three species are known from the East) only one other species of this family is Oriental—*Tanyderus ornatissimus*, Dol., from Amboina.

The larval characters of the PTYCHOPTERINÆ have been investigated by Brauer,* and that biologist considered that as the head of the larva is not imbedded in the thoracic skin, as is the case in the rest of the TIPULIDÆ, it is justifiable to separate the group as a distinct family. Osten Sacken has also referred to the same subject.†

Genus **PTYCHOPTERA**, *Mg.*

Ptychoptera, Meigen, Illig. Mag. ii, p. 262 (1803).
? *Ctenoceria*, Rondani, Dipt. Ital. Prod. i, p. 187 (1856).

GENOTYPE, *Tipula contaminata*, L.

Head transverse, with rather prominent, round, bare eyes. Epistome well arched, nearly perpendicular, terminating in a blunt point. Frons broad in both sexes, flattened. Ocelli wholly absent. Proboscis prominent, with round pubescent labella. Palpi elongate, slender, four-jointed, the last one the longest, but not so conspicuously longer than the others as in the TIPULINÆ. Antennæ 16-jointed, long, prominent, slender, nearly bare; scapal joints short, the 1st longer than the 2nd; flagellar joints cylindrical, 1st joint considerably longer than the others, which gradually diminish in length, apical joint sometimes indistinct. *Thorax* prominently arched, suture almost imperceptible. Scutellum small, metanotum well developed. *Abdomen* elongate, often narrowed in middle,

* Verh. zool.-bot. Ges. Wien, 1869, pp. 844–847.
† Cat. North Amer. Dipt., 1st ed., p. 221, note 36 (1878).

and always with a clubbed tip in the male; widened before the end (which is pointed) in the female, with a normally shaped horny ovipositor. Genitalia very distinct. *Legs* long, but less so, comparatively, than in the other two subfamilies. Coxæ broad, moderately long; tibiæ spurred at the tip; metatarsus very long, claws small; pulvilli distinct. *Wings* of moderate size, with rounded tips and somewhat narrowed at the base. One marginal and two submarginal cells; four posterior cells. Auxiliary vein long, ending in the costa; 1st and 2nd longitudinal veins also ending in the costa; subcostal cross-vein near the tip of the former, the 2nd longitudinal vein originating about the middle of

Fig. 40.—Early stages of *Ptychoptera*; *a*, larva; *b*, pupa.

the wing; 3rd longitudinal originating soon after the beginning of the 2nd, forked beyond its middle; anterior cross-vein at or near its base; 4th longitudinal forked at or near posterior cross-vein, which is nearly opposite the anterior cross-vein, and is short; the 6th longitudinal vein absent; the 7th present, short, more or less curved downwards. The wings are held divaricate in repose.

Range. Europe, North America, and the Himalayas.

Life-history. The larva of *Ptychoptera* is whitish in colour, very attenuated, of thirteen segments, including the head, with a long

slender tubular tail. The head is hard and small, bearing a pair of eye-spots and furnished with two very minute antennæ, which are almost imperceptible. It moves by means of the stiff bristles, directed backwards, affixed to the rather enlarged posterior rim of each segment; in addition, there are three pairs of pseudopods or pro-legs. It breathes through the tail, lying near the surface of the water (sometimes floating at full length on it) of shallow pools or brooks, preferring stagnant and muddy water. It is said to live, during the greater part of the year, imbedded in the mud of such places, with usually only the tip of the tail projecting.

The pupa is furnished with a long respiratory tube, and floats on the surface of the water during spring and summer. The abdomen is provided with five circles of fine spines, by the aid of which the pupa peregrinates to firm ground just before the emergence of the imago.

Several of the older authors have left records concerning the life-histories of some of the European species of this genus, in particular De Geer, Réaumur, and Lyonet; whilst, more recently, the early stages of *Ptychoptera lacustris*, Mg., have been described by Beling,* and those of *P. contaminata*, L., by Grubben.† Brauer also illustrates the larva of *Ptychoptera.* ‡

Table of Species.

Wings with a dark brown cross-band	*distincta,* Brun., p. 281.
Wings unmarked.	
Hind femora mainly black on basal two-thirds	*tibialis,* Brun., p. 282.
Hind femora wholly orange-yellow	*atritarsis,* Brun., p. 283.

192. **Ptychoptera distincta**, *Brun.* (Pl. V, fig. 1.)

Ptychoptera distincta, Brunetti, Rec. Ind. Mus. vi. p. 232 (1911).

♀. *Head*: frons, vertex and back of head black; frons one-fourth width of head. Epistome bulbous, shining brown, bare; proboscis normal, yellow; palpi long, yellow. Antennal scape brownish yellow; flagellum black, shortly pubescent. *Thorax* wholly shining black, bare. *Abdomen* black, microscopically pubescent; basal two-thirds of second joint and basal half of third joint reddish orange. Tip of last segment and the ovipositor reddish yellow. *Legs*: coxæ reddish yellow; femora at base concolorous, deepening to brown at tip; tibiæ and tarsi black. Except the coxæ, which are nearly bare, the legs are wholly covered with short thick pubescence. *Wings* very pale grey, yellowish brown on the costal part; a dark brown central cross-band along the middle cross-veins from the origin of the 2nd vein

* Verh. zool.-bot. Ges. Wien, 1886, p. 171.
† SB. Akad. Wiss. Berlin, lxxii (1875), plate.
‡ Denk. Akad. Wiss. Wien, xlvii, pl. i, fig. 18; pl. ii, fig. 19.

to the tip of the 5th vein, also a large apical brown part enclosing the forks of the 3rd and 4th veins, both these brown parts in the wing being connected with the costal darkening. Halteres black.

Length 9 millim.

Described from one female in the Pusa collection taken by Mr. Howlett, 3-9. vi. 09, at Darjiling, 7000 feet.

193. Ptychoptera tibialis, *Brun.*

Ptychoptera tibialis, Brunetti, Rec. Ind. Mus. vi, p. 233 (1911).

♂ ♀. *Head*: frons shining black, smooth, bare; eyes widely separated; back of head brown; face below antennæ, underside of head, and palpi all bright yellow. Antennæ 15-jointed; 1st joint cylindrical, yellow, brown towards tip; 2nd short, bead-like, dark yellow, mixed with brown; 3rd as long as the next two together; remainder elongated, compressed at each end, black; antennæ minutely and thickly pubescent, and with moderately long scattered hairs throughout. *Thorax* of male æneous black, bare, shining; the suture separating the prothorax (which extends backwards through the mesothorax, so to speak, almost to the scutellum) rather deeply cut; humeri bright yellow; a white-dusted patch in front on dorsum of prothorax. The mesothorax is divided from the metathorax by a distinct suture, which on reaching the extension of the prothorax follows it posteriorly and divides the rear portion of the metathorax by a deeply cut suture with a small yellow V-shaped spot in the middle of it, this suture reaching the small bright yellow scutellum. Posterior calli raspberry-red, enlarged, elongated and extending from the scutellum to the base of the wings. Sides of thorax shining black; a yellow scaly mesopleura connected with the yellow base of the wings; metapleuræ with silvery sheen, seen from above; metanotum large, shining æneous black, quadrate, bare. In the female the thorax is orange, with a black stripe on each side of the dorsum, the suture blackish, and a large black mark below the scutellum, which latter, with the whole metanotum, is orange. *Abdomen* of male bright pale orange-brown, tending towards yellowish; 1st segment all blackish, 2nd elongated, black at base and tip; the next three segments black on posterior border. In female orange-brown, 2nd segment yellowish. Belly entirely orange-yellow (♂ ♀). The male genitalia very large, complex, bright reddish orange, with some close black pubescence; female genitalia narrow, cylindrical, concolorous. *Legs*: coxæ bright yellow, hind pair black on the outside of the basal half; femora bright yellow, hind pair black on the basal two-thirds except at the extreme base; anterior tibiæ yellow, with the extreme tips dark brown, the middle pair slightly darker on the basal half, the hind pair with basal half black except the extreme base; on the apical half the bright golden yellow hair is very thick; tarsi blackish brown. The legs throughout are closely pubescent, the

pubescence being concolorous with the ground-colour. *Wings* yellowish grey, beautifully iridescent, unmarked, minutely pubescent on posterior border; venation as in *P. contaminata*, veins dark brown. Halteres bright yellow.

Length ♂ 7–8 millim., ♀ 9 millim.

Described from several examples taken by me at Darjiling, 7000 feet, 7–16. x. 05 and 30. ix. 08.

Type ♂ in the Indian Museum; type ♀ and cotype ♂ ♂ in my collection; cotype ♀ from Darjiling in the Vienna Museum.

Normally *Ptychoptera* should have 16-jointed antennæ, but the 3rd joint in this species is as long as the next two together, and occasionally it appears as if two joints were present, but a careful examination convinces me that it is single. In most of the specimens the whole antennæ are certainly present and undamaged. The species, however, cannot possibly be removed from this genus, it being in every character a true *Ptychoptera*.

194. **Ptychoptera atritarsis**, *Brun.*

Ptychoptera atritarsis, Brunetti, Rec. Ind. Mus. vi, p. 234 (1911).

♀. *Head*: whole upper part from the vertex down to the antennæ black, bare, shining; face below antennæ, proboscis, palpi (except black tips), wholly orange-yellow. Antennæ black, but microscopically covered with hoary dust; scapal joints orange-yellow; a few hairs on all the joints. Eyes black; the orbit at the sides brownish yellow, with a set of black hairs; orbit disappearing at the vertex. Neck yellow. *Thorax* orange-yellow, practically bare, dorsum slightly ferruginous. A black stripe on the front of the prothorax, which is carried downwards as far as the fore coxæ; two small black spots on the dorsum behind the upper end of this stripe; a black stripe begins widely on each humerus, extending narrowly backwards to the middle of the metanotum, spreading inwards slightly at the base of the wings, and narrowly interrupted immediately behind their insertion. Underside of thorax shining coal-black, but the sides of the mesothorax are orange-yellow, and a thick scaly process issues from the base of the wings, proceeds widely downwards nearly to the middle coxæ, and then bends hindwards and upwards, joining the scutellum, and enclosing the base of the halteres in its path. A narrow black line runs interruptedly round the posterior border of the thoracic dorsum, replaced immediately in front of the scutellum by two small black spots. Metanotum oblong, large, traces of a black central streak. Scutellum oblong, elevated but moderately small, supported at each corner by a pronounced scutellar ridge. *Abdomen* orange-yellow, with a few irregular hairs; 1st segment with a yellowish white sheen at the extreme base in front; a narrow black cross-band on the dorsum near the base of the segment, which line is continued forwards along the sides of the abdomen as far as the base. Posterior borders of all

the segments, including the 1st, on which it is widest, but excluding the last, with a blackish irregular band. Ovipositor in the shape of two blades close together, orange-yellow. Belly uniformly orange-yellow. *Legs*: coxæ lemon-yellow, the hind pair having two small black spots on the hinder side at the base. Femora and tibiæ uniformly bright orange-yellow with minute closely-set concolorous pubescence. Tarsi wholly coal-black. *Wings* yellowish grey, costal cell yellow; veins black. Halteres yellow.

Length 8 millim (without ovipositor).

Described from two nearly perfect females in the Indian Museum collection from Siliguri, at the foot of the Darjiling Hills, 18–20. vii. 07.

Subfamily TIPULINÆ.

The TIPULINÆ are distinguished by the auxiliary vein ending in the 1st longitudinal vein, and not in the costa. The humeral cross-vein, close to the base of the wing, is the only cross-vein in contact with the auxiliary vein, the subcostal cross-vein being wholly absent. The 1st longitudinal vein nearly always turns down into the 2nd and not upwards into the costa, the end of the vein becoming much attenuated towards its tip. A small cross-vein, which I propose to call the *costal cross-vein*, connects the 1st longitudinal vein near its tip with the costa. The 2nd longitudinal vein has a short anterior branch that is nearly perpendicular, and this joins the costa just beyond the costal cross-vein, thus forming a small characteristic cell, known as the rhomboidal cell (at first called by Osten Sacken the trapezoidal). This cell is absent in *Dolichopeza* owing to the 2nd longitudinal vein not being forked. The lower branch of the 4th longitudinal vein forks at the inner end of the discal cell, a little before it or towards the middle of that cell, never beyond it; the upper branch forks beyond, or at the earliest, in contact with the distal limit of the discal cell. The first longitudinal vein forks just after quitting the posterior cross-vein; this causes the ultimate posterior cell in such cases to be pentagonal in shape, its inner end being always pointed. The discal cell is nearly always pentagonal or hexagonal.

A peculiar character nearly always visible in the TIPULINÆ, but especially noticeable in the genus *Tipula*, is what may be termed, for want of a better name, the "obliterative streak," running from the neighbourhood of the stigma nearly straight across the wing, crossing the discal cell somewhere on its basal half or about its middle, and disappearing soon after quitting that cell. Osten Sacken refers to it as a "fold" of the wing. Its effect is partially to obliterate, or at least to weaken, the veins with which it comes in contact, and its course is emphasized by

the actual ground-colour of the wing within its track being distinctly paler. This peculiarity is indistinct or absent in most species of *Pachyrhina*, and seems to be practically absent in the LIMNOBIINÆ.

The proboscis is distinctly produced, and the tip on its upper-side is again produced more narrowly, forming what is known as the nasus or nose. This is especially prominent in the two leading genera *Tipula* and *Pachyrhina*, which in themselves comprise the bulk of the species in the subfamily. It is, however, reduced to an obtuse projection with a tuft of hairs in *Ctenophora*, *Pselliophora*, and *Dolichopeza*. Its presence is variable, being distinct in *Scamboneura* and *Megistocera* (both Oriental genera, with two and one species respectively), also in *Brachypremna*, an exotic genus.

The neck, though not conspicuously narrowed, is very distinct in *Tipula*, *Pachyrhina* and *Brachypremna*; short in *Scamboneura* and *Megistocera*; almost absent in *Ctenophora* and *Pselliophora*, and quite absent in *Tanypremna*.

The frons is smooth or greatly arched (*Tipula*), sometimes gibbous (*Pachyrhina*, *Ctenophora*, *Pselliophora*).

The antennal scape is composed of a long cylindrical 1st joint, a quite short 2nd joint which is never (so far as I am aware) broader than either the 1st scapal or 1st flagellar joints as is so frequently the case in the LIMNOBIINÆ. The flagellum is very varied in construction, sometimes pectinate in the male (*Ctenophora*, etc.) or subpectinate (various genera); serrate, as in some species of *Tipula*, or cylindrical, or with ovate joints, as in the majority of species of both *Tipula* and *Pachyrhina*. In a few genera it is extremely elongate and filiform, as in *Megistocera*, in which genus its length in the two sexes often varies in the same species, the male possessing an excessively long antenna, the female one of normal length. The flagellar joints are verticillate in the TIPULINI, but not so in the CTENOPHORINI.

There are several genera with peculiarly constructed antennæ, more or less pectinate in nature, which, not being Oriental, need not be discussed here; yet it is as well to note that these abnormal forms are by no means uncommon in this subfamily, mostly coming from South America and Australia. Many of them represent intermediate stages between *Ctenophora* and *Tipula*.

The extra length of the leg is generally considered as one of the characters of the TIPULINÆ, as contrasted with the LIMNOBIINÆ, but it is by no means conspicuous, although probably the tarsus (especially the metatarsus or first joint) is proportionately longer. Even *Dolichopeza*, with its excessively long and delicate legs, is paralleled in the LIMNOBIINÆ by such genera as *Mongoma* whilst in one section of the present subfamily (CTENOPHORINI), the legs are comparatively the shortest and stoutest in the family.

The position of the wings in repose is not a good distinctive character, though it has been put forward. TIPULINÆ are commonly supposed to rest usually with their wings divaricate (or

spread out flat), and *Tipula* itself generally does so; yet it has been observed that in the group containing those species with marmorated wings (as in the *himalayensis* group among Oriental and the *vernalis* group among European species) the wings are more often folded when resting. Moreover *Pachyrhina*, the second largest genus in the subfamily, forms an important exception. The value of the habit as a subfamily character is further discounted by the fact that some LIMNOBIINÆ assume the spreading attitude of the wings when in repose.

Much difficulty is experienced when an attempt is made to define the DOLICHOPEZINI, CTENOPHORINI, and TIPULINI satisfactorily one from the other, these groups, though essentially forming one subfamily, being separated amongst themselves by characters "perceptible to the entomological sense only," as Osten Sacken said.

The extreme length and delicate nature of the legs (and, in a somewhat less pronounced degree, the body also) in *Dolichopeza* and its allies is practically the chief difference between these genera and both the *Ctenophora* and *Tipula* groups. The absence of the anterior branch of the 2nd vein and the double forking of the anterior branch of the 4th vein will suffice to determine *Dolichopeza* itself, but in one or two other genera of DOLICHOPEZINI the former is present, being perpendicular and not oblique, and this feature makes the rhomboidal cell more or less square.

Between the CTENOPHORINI and the TIPULINI several stronger differences exist, although it must be remembered that there are a number of exotic genera which, in the matter of antennæ, bridge the apparent gap between the conspicuously pectinate form prevalent in male *Ctenophora* and the normal antenna of *Tipula*.

The following table, therefore, must be accepted with the intimation of the existence of various intermediate and anomalous forms, although none such are actually present in the Indian fauna.

Table of Sections of the TIPULINÆ.

Legs not of excessive length and slenderness, either comparatively short and stout or normally long and slender; the 2nd longitudinal vein forked, the anterior branch short and oblique.

Body stouter; neck absent; nasus reduced to an obtuse hairy projection; antennæ normally pectinate or subpectinate in the male, never verticillate; legs distinctly shorter and stouter; abdomen generally broader, often widened just before or at the tip; genitalia large and complex. Body colours nearly always vivid and well marked .... CTENOPHORINI.

Body comparatively slender, elongate, normally tipulidiform; neck almost always present; nasus always present, elongate, narrow;

antennæ normally not pectinate,* the flagellar joints always verticillate; legs normally long and slender; abdomen elongate, cylindrical, seldom widened towards or at the tip, unless due to the genitalia, which are generally large and complex in *Tipula*, less so in some other genera. Body colours mainly brownish and yellowish; brighter in *Pachyrhina* .... TIPULINI.

Legs of excessive length and slenderness, more so than in the normal Tipulid forms; the 2nd longitudinal vein normally not forked (*Dolichopeza*), if so, the anterior branch either obsolete or perpendicular, thus making the rhomboid cell more or less square; nasus normally absent † .... DOLICHOPEZINI.

It must be remembered that probably not one of the characters herein employed is absolutely consistent throughout any particular section, the nearest approach to stability perhaps being the verticillate nature of the flagellum in TIPULINI.

Section *CTENOPHORINI.*

In addition to the genera with typically pectinate antennæ in the males, this section contains several others in which this character is less fully developed or even entirely absent. Yet as the group is represented in the East by practically one genus only (*Pselliophora*), there is no need to enumerate the peculiarities of the exotic forms. Apart from *Pselliophora*, a species of *Prionota* has been described by Van der Wulp from Java (*P. nigriceps*).‡

All the species described by the older authors correctly belonging to *Pselliophora* were placed in *Ctenophora*, but they have now all been satisfactorily referred to the former genus with one exception, *C. xanthomelana*, Walk., of which only the female was originally described, and the species not having been seen since, it is impossible to decide where it should be placed, the probability being that it too is really a *Pselliophora*. It comes from "East India."

As descriptive of the section, little can be added to the characters given in the table above, so far as the Oriental genera are concerned. The pectinate antennæ in the males, the shorter, stouter legs, the usually bright and sharply defined colours that distinguish most of the species, make them easily recognisable.

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* Exceptions occur, but not in Eastern genera; one, for example, *Ozodicera*, comes from South America, which is practically a *Tipula* with pectinate male antennæ.

† Absent in *Dolichopeza*, but present in *Scamboneura* and *Megistocera*, both Oriental genera.

‡ *Prionota* may be described briefly as having the appearance of a *Pachyrhina* or *Tipula*, the venation of a *Ctenophora*, and antennæ markedly serrate on the lower side in both sexes, owing to the emargination of the base of each joint of the flagellum except the last one. *P. nigriceps*, Wulp, the only known species, has an orange-yellow thorax, an abdomen yellowish on the basal half, blackish on the apical half, with the legs yellowish, blackish at the joints. It is 16 mm. in length.

Genus CTENOPHORA, *Mg.*

Ctenophora, Meigen, Illig. Mag. ii, p. 263 (1803).
Tanipteru, Latreille, Nouv. Dict. Hist. Nat. p. 428 (1804).

GENOTYPE, *Tipula atrata*, L.

Head transverse, with somewhat prominent rounded bare eyes. Epistome enlarged, snout-like towards the tip. Proboscis rather prominent, with rounded hairy labella. Palpi four-jointed, long, the last joint the longest, whiplash-like. Frons in both sexes broad; ocelli absent. Antennæ long, prominent, 13-jointed; the flagellar joints in the male cylindrical, with two, three, or four comb-like branches; in the female rounded, or saw-like on the underside. *Thorax* very arched, neck moderately distinct; the transverse suture moderately deep and distinct, a little emarginate posteriorly. Scutellum small, metanotum well developed. *Abdomen* elongate, eight-segmented, clubbed at the tip in the male, widened towards, but not at, the tip in the female. Genitalia of male large and complex, their structure varying with the species; sometimes with a conspicuous organ on the belly in addition. Ovipositor in female broad, sword-like, prominent, horny. *Legs* moderately long and stout, but about the shortest of any in the family TIPULIDÆ; tibiæ with strong spurs at the tip; metatarsus lengthened, claws distinct. *Wings* comparatively large, of moderate width, the anal angle somewhat squared. One marginal, two submarginal, and five posterior cells. Auxiliary vein more than half the length of the wing, turning into the 1st longitudinal vein at its tip; the 1st longitudinal vein turning at its tip into the short anterior branch of the 2nd vein, which is practically always oblique or nearly perpendicular; a short cross-vein (costal cross-vein) unites the 1st vein, shortly before its tip, to the costal vein, thus forming the rhomboidal cell characteristic of the TIPULINÆ; the 2nd longitudinal vein emerges about the middle of the wing, generally bisinuate; the 3rd generally before the middle of the 2nd, gently curved; the anterior cross-vein is comparatively short, the discal cell pentagonal, the 2nd posterior cell petiolate, the petiole moderately long, the posterior branch of the 4th longitudinal vein forking at about the middle of the discal cell, the posterior cross-vein placed at the fork; the 5th, 6th, and 7th veins normal, the latter rather short.

Life-history. The metamorphoses of several European species of this genus are known, being described by Fischer, Bouché, and others.* The larvæ live in decaying wood, but in view of the probability of the genus not being Oriental, they are not described here.

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* Brauer has described the life-history of *C. bimaculata*, Kaltenbach; also Perris that of *C. atrata* (in decaying willows). Schiner mentions a second generation, born in captivity, of the former species.

All the Oriental species of the older authors, described originally under *Ctenophora*, are now referred to *Pselliophora*, and it is highly probable that the present genus does not exist in the Oriental region at all, being confined exclusively to Europe, Siberia and North America, with the exception of a single species from Persia.*

There is, however, one species, *C. xanthomelana*, Walk., from "East India," of which it is impossible to decide the correct generic position, the male being still unknown; in fact, the original type female (which still exists in good condition in the British Museum) appears to be the only example in existence.

Ctenophora melanura, Walk. (List Dipt. Brit. Mus. i, p. 78) is not even a Tipulid at all, but a large species of *Sargus*, as stated by Osten Sacken after examining the type at the British Museum.

195. **Ctenophora xanthomelana**, *Walk.*

Ctenophora xanthomelana, Walker, List Dipt. Brit. Mus. i, p. 77 (1848).

"Nigra, thorace ferrugineo rufo trivittato, abdomine basi fulvo, alis fuscis.

"Head and appendages black; feelers serrulate, much less than half the length of the chest; chest ferruginous, with three very broad brownish red stripes, varied with reddish brown on each side and behind; abdomen black, attenuated towards the tip, and reaching much beyond the length of the wings; segments from the first to the third, orange-tawny; legs black, pubescent; wings brown, with a small dark brown brand near the tip of the fore border; veins dark brown; poisers tawny with brown tips.

"Length of the body 14 lines; of the wings 22 lines.

"East India. From Mr. Children's collection." (*Walker.*)

The male of this species still being unknown, it is impossible to say whether it is a true *Ctenophora* or not. In all probability it will eventually prove to be a *Pselliophora*, a genus confined to the Eastern tropics, with the exception of a single species (*P. fumiplena*, Walk.) from China.† Until, however, the point is decided, both the genus *Ctenophora* and the species *xanthomelana* must presumably figure in Oriental lists.

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* Persia is, however, as much Palæarctic as Oriental. It is true that there is yet one species of which the locality is still unknown—*C. constans*, Walk. (Dipt. Saund. p. 448, ♀), but this hardly affects the argument.

† Unless this species comes from South China (the original reference gives merely "China"), I should have doubted its being a *Pselliophora* but for Osten Sacken's examination of the type at the British Museum, where are also some other specimens from China which appeared to that author to represent a variety of the same species.

Genus PSELLIOPHORA, *Os. Sac.*

Pselliophora, Osten Sacken, Berlin. Entom. Zeits. xxx, p. 165 (1886).

GENOTYPE, *Tipula læta*, F.; by present designation.*

Osten Sacken's differentiation of this genus from *Ctenophora* is as follows:—

"*Pselliophora* (which means bracelet-bearer), gen. nov., comes nearest to *Ctenophora*, sensu stricto, represented by the European species *pectinicornis*, *flaveolata*, *elegans*, etc. It is easily distinguished, however, by the following characters:—

"(1) The four branches issuing from the same antennal joint (in the male) are of the same length (in *Ctenophora*, s. str., the inner pair is distinctly shorter); (2) the branches of the male antennæ are clothed with rather long, soft, not very dense hairs; (3) the 12th joint has two pairs of branches (only one in *Ctenophora*, s. str.); (4) the forceps of the male has a different structure; the long protruding adminiculum, so conspicuous in *Ctenophora*, s. str., is wanting here; (5) the females are more difficult to distinguish from those of *Ctenophora*, s. str., the most trustworthy character, as far as I can see, lies in the structure of the 3rd joint of the antennæ (1st joint of the flagellum), which here becomes broader from base to tip, without having the expansion on the underside, such as exists in the females of *Ctenophora*, s. str.; the other joints are more rounded, and thus the flagellum appears less serrate on the underside; the latter half of the abdomen is much less expanded here, the upper valves of the ovipositor more straight and pointed.

"Most of the species of this group have a white ring at the base of each tibia (hence the name of the group); the wings are often brown, with well-defined white or yellowish spots; sometimes uniformly brown, or yellowish with brown tips. The two pairs of branches on joints 4–12 of the male antenna are slender and rather long, from one and a half to two and a half [times] the length of the joints; the longest are in the middle of the flagellum."

The present genus is identical with *Ctenophora* except for the few differences mentioned above.

Those new species of which only the females are known are placed here only temporarily, as until their males are discovered it is impossible to define their generic position with certainty.

Life-history. The metamorphoses of no Oriental species have been studied, but the larvæ probably live in decaying wood, as is the case in the allied genus *Ctenophora*.

Table of Species.

1. Tibiæ with at least the hinder pair with a pale coloured ring near base	2.
Tibiæ without a pale ring on any of them.	3.

* No type species has, so far as I am aware, been indicated for this genus. I propose *P. læta*, F., because it is the most widely distributed species in the East, the genus being essentially an Oriental one.

2. Wing with only two large spots and a small intermediate one (normally)*..	*læta*, F., p. 291.
Wing with four large spots and generally some smaller ones (normally)*......	*taprobanes*, Wlk., p. 293.
3. Wing with conspicuous blackish or brownish marks	4.
Wing pale yellow, wholly unmarked ..	*immaculipennis*, Brun., [p. 294.
4. Flagellum not serrate (presumably)† ..	*chrysophila*, Wlk., p. 295.
Flagellum deeply serrate on underside .	*serraticornis*, Brun., p. 296.

196. **Pselliophora læta**, *F.* (Pl. V, fig. 2; Pl. VI, fig. 9.)

Tipula læta, Fabricius, Ent. Syst. iv, p. 239 (1794).
Ctenophora læta, auctt.
Pselliophora læta, var. *trilineata*, Brunetti, Rec. Ind. Mus. vi, p. 240 (1911).

♂ ♀. *Head* bright orange; proboscis and palpi orange or orange-yellow with a little concolorous pubescence. Antennæ of male with thirteen joints, of female eleven; in both sexes the 1st scapal joint is very large, approximately oblong, slightly curved upwards, orange, sometimes with black streaks on the upper-side and sometimes wholly reddish brown or brownish orange, the 2nd scapal joint very small, easily overlooked, especially in the male in which it is orange, whereas in the female it is always black. In the male the 1st flagellar joint has a blunt projection on the lower side, making the whole joint Y-shaped, black, with a pale yellowish white tip; it is unbranched. The remaining joints in the male are cylindrical, elongate, the basal two-thirds black or blackish brown, the apical third pale yellowish; each joint bears two pairs of slender finger-like blackish brown branches which droop downwards; the first pair is situated at the base of the joint, the second at the distal end of the black portion; the last joint is simple and much elongated. All the branches, and in fact the whole antennæ, are shortly pubescent. In the female the flagellum is distinctly only of nine joints, the 1st longer than the rest, broader at the tip, the 2nd rather similar though not so long, the rest subannular, the apical joint conical. The whole flagellum black, with short black pubescence. *Thorax* wholly bright orange, a little yellow just below the dorsum and sometimes on the scutellum and metanotum. *Abdomen* very variable; bright orange, with the bases of the segments more or less black; sometimes the greater portion of the dorsal surface blackish, sometimes hardly any black colour present. Genitalia of male orange, with blackish marks, these varying also; in the female shining black, often the last two or three segments black also. *Legs*: coxæ and femora bright orange, tips of latter broadly black; tibiæ and tarsi black or blackish, a moderately wide, distinctly pale yellow or yellowish white band on the former at or

* Both species are liable to variation in the wing-markings, but it is impossible to mistake one for the other if the descriptions of each are consulted.
† It is to be presumed Walker would have noticed the serration if present.

immediately beyond the base. Legs microscopically pubescent. *Wings* rather deep brown or blackish brown. Two large, very conspicuous oval orange-yellow spots, beginning on the costa and extending nearly to the hind margin, the distal side of the first spot being just beyond the middle of the wing; the second spot begins a little before the proximal side of the discal cell and encloses the posterior cross-vein, its distal costal limit being at the tip of the 1st longitudinal vein; between these two large spots a smaller one, round or oval, near but not touching the costa, enclosing the base of the 2nd longitudinal vein. The base of the wing is also orange-yellow, in some cases the colour wholly united with the nearer large spot, but always joined to it on the costa. In one example the small round spot is also united to the proximal one of the large spots. In some specimens the small spot is much reduced, possibly occasionally absent. Halteres orange.

Length ♂ 10–12, ♀ 15 millim.

Redescribed from several specimens of both sexes in the Indian Museum and my own collection from Dehra Dun (foot of Mussoori Hills); Kanara, Bombay, viii. 07; Bangalore, 3000 ft., 11–15. x. 10 (*Annandale*); Trivandrum, Travancore State, iv. 89; Calcutta, 13. vii. 07. Also in the Vienna Museum and my own collection from Ceylon. Apparently commonly distributed throughout India, and probably also the East generally. Van der Wulp records it from Bombay, Sind, and Ceylon.

Type. The location is uncertain, unless it is in the old Fabrician collection. It is curious that although described in a few words only, over a hundred years ago, the species is so well marked that there does not exist a single synonym to it.

"Van der Wulp quotes 'pl. ii. 1' as a figure of this species in Wiedemann, but I find no such figure. In the Pusa collection are a male and female taken *in cop.* in the Shevaroys, 4000 ft., Madras Presidency, 26. viii. 07, on coffee bushes. In the Indian Museum are two specimens that represent well-marked varieties of this species, to one of which a name is given. The first specimen is from Katihar, Purnea District, N. Bengal, and is a female in good condition taken by Mr. Paiva, 23. iii. 09. It differs from the typical form by all the cells on the posterior half of the wing being pale grey in their centres; one or two centres being almost entirely clear. The 3rd, 4th, and 5th abdominal segments have a subquadrate black spot on the dorsum of each.

"The second specimen I term var. *trilineata*, from the presence of the usual three tipuliform black thoracic stripes, the median one extending over the anterior margin on each side as far as the front coxæ. The outer stripes are replaced behind the suture by a large spot on each side. There is a blackish mark on the pleura below the wing, and the hinder side of the metanotum is shining black. The wings have the clear spaces as in the preceding variety, though not quite so obvious, and the last two or three abdominal segments are blackish, some distinct darkening of the preceding segments being noticeable. The yellow colour of the legs is

deep chrome, not orange. It was taken by Mr. H. L. Andrewes, September 1910, in the Nilgiri Hills (3500 ft.).

"The yellow marks on the wing in both forms are so exactly like those in the typical form that they cannot be regarded but as varieties." (Brunetti, *l. c.*, p. 241).

197. **Pselliophora taprobanes**, *Walk.* (Pl. V, fig. 3; Pl. VI, figs. 10, 11.)

Ctenophora taprobanes, Walker, List Dipt. Brit. Mus. i, p. 77 (1848).

♂ ♀. *Head* yellow, often lemon-yellow, a dark brown spot or pair of spots on back of occiput, a small elongate mark over base of each antenna or at its side. Proboscis yellow or brownish yellow, often with a brown streak on each side above, brown below; palpi with 1st joint brown, the remainder yellow, wholly pubescent. Antennæ much as in *P. læta*, except that the scape is more black (probably sometimes wholly so). The whole antenna in female black, shaped mainly as in *læta*, but the joints more flattened, not at all annular. *Thorax* yellow, sometimes tinged with a little orange, sometimes lemon-yellow. Three dorsal brown stripes of the usual pattern in Tipulidæ, the median one beginning on the anterior margin, generally narrowly divided in the middle; the outer ones consist of an oval spot in front of the suture, joined to one, sometimes two, contiguous spots behind the suture; the three (or two) form a stripe from well behind the shoulder to the posterior margin of the dorsum; a brown streak at base of collare, carried on each side right down at the sides and continued on to the fore coxæ. Scutellum and metanotum concolorous with thoracic dorsum; a brown spot on each side of the scutellum, like a continuation of the outer thoracic dorsal stripes. The metanotum with a brown mark (sometimes divided) on hinder side. Sternopleuræ with a broad dark brown horizontal stripe on upper part and another on lower part, sometimes indistinct (possibly occasionally absent); a brown mark here and there on the rest of the pleuræ. *Abdomen* yellow or orange-yellow; bases of segments more or less dark brown or blackish, the extent of the colour variable, and apparently more extensive in the female. The basal segment generally wholly yellow, the apical one or two segments generally black. Genitalia of male shining brownish yellow, with blackish marks and pubescence. Ovipositor of female shining black. *Legs*: coxæ yellow or brownish yellow, often with dark brown streaks; femora dirty brownish yellow; tibiæ and tarsi similarly coloured but darker, the former with a moderately narrow whitish ring at base. *Wings* moderately deep brown, with yellow marks that are variable, usually four in number and of considerable size. Normally, two rather large round or oblong spots just below the costa, the first placed clear of the base of the wing, its distal side

at one-third of the wing's length; the second large spot touches the tip of the 1st longitudinal vein, enclosing the anterior cross-vein and the discal cell and posterior cross-vein. Between these two larger spots a smaller round one over the base of the 2nd longitudinal vein, as in *P. læta*, and a similar round spot on hind margin of wing over tip of 6th longitudinal vein. Very small spots and streaks are liable to occur in various parts of the wing, especially at the extreme tip, the tips of the 4th and 5th veins, and so on. Sometimes a yellow spot near, but not at, the base of the wing, and connected with the proximal large spot on the costa. Halteres relatively small, brownish yellow.

Length ♂ 9–14, ♀ 14–15 millim.

Redescribed from several examples of both sexes in the Indian Museum and my own collection, all from Ceylon, where it appears to be a common species especially in May, June and July, small parties of them being seen flying together over the roadways and under branches of trees. The Indian Museum dates range from 29. v. to 18. ix., but it probably occurs in Ceylon all through the summer. Mr. Gravely has taken it at Peradeniya "at light."

Type (a female) in the British Museum, from Ceylon.

The male is much less common than the female and I believe has not been described, but it is present in the Indian Museum and shows no peculiarities beyond the ordinary sexual differences.

198. **Pselliophora immaculipennis**, *Brun.* (Pl. VI, figs. 7, 8.)

Pselliophora immaculipennis, Brunetti, Rec. Ind. Mus. vi, p. 243 (1911).

♀. *Head* bright shining orange-yellow, with scattered hairs; a frontal spot, almost bisected in the middle (just above the antennæ), shining light yellow-brown, extending from eye to eye. Eyes small, black, and placed well forward so that the back of the head is very wide, and joins the equally broad vertex which is orange-yellow. Face rather considerably covered with long yellow hairs. Antennæ concolorous, covered with microscopical silver-grey dust: the 1st joint long, cylindrical, 2nd short, bead-like, 3rd and rest cylindrical; 3rd as long as 1st, remainder gradually shortening, the last three very short and close together, the 13th style-like. Palpi orange-yellow, tip black. *Thorax* concolorous, with irregularly scattered hairs, shining, bare. The prothorax reduced to a small circular thick disc, bright yellow; humeri brown. Mesothorax with three wide, shining, light brown stripes, tapering behind, the 1st central and attaining the anterior margin, the stripe on each side reaching the shoulders and terminating above the mesopleuræ. Behind the middle transverse suture the dorsum widens out until the posterior corners form sharp angles. This posterior portion bears a wide brown stripe on each side, divided by a small longitudinal suture; the stripes beginning behind the ends of the two dorsal side stripes which are in front, and extending backwards to the small scutellum.

which is all yellow. Metanotum of moderate size, yellow. Sides of thorax yellow, with a shining, very dark brown triangle just below the root of the wing, and a downward brown streak behind and rather above it. Underside of thorax dark brown; a prominent, small, circular, pale yellow callosity in front of the hind coxæ. *Abdomen* concolorous, with irregularly scattered hairs. Bases of all the segments brown, the part so coloured apparently varying in breadth; 2nd segment much contracted; 3rd and 4th suddenly widened; the rest together tapering to a point. Ovipositor short, reddish brown, shining. Belly yellowish, with traces of some transverse bands, corresponding to those on the upperside. *Legs* yellowish tawny; coxæ brownish yellow, tarsi blackish, bare of long hairs or bristles, with microscopical yellow pubescence on the femora, which is much mixed with black pubescence on the tibiæ. *Wings* yellowish, unmarked, stigma yellowish, indistinct, small; veins and halteres brown.

Length 12 millim.

Described from one male from Sylhet in the Indian Museum, in perfect condition.

199. **Pselliophora chrysophila**, *Walk.*

Ctenophora chrysophila, Walker, Proc. Linn. Soc. Lond., Zool. i, p. 6 (1857).

Ctenophora chrysopila, Osten Sacken, Berlin. Ent. Zeits. xxx, p. 169 (1886).

♀. *Head*, with scape, wholly bright orange, palpi slightly brown, flagellum black, the form of the joints much as in *P. taprobanes*. *Thorax* with sides, scutellum, and metanotum wholly bright orange; a very faint indication of three darker stripes. *Abdomen* bright orange, with short concolorous pubescence; posterior margins of segments a little deeper orange, and small blackish marks (apparently the ground-colour of the abdomen shewing through the tomentum) here and there at the sides. Belly similar. Last segment and ovipositor shining black, tip of valves reddish. *Legs*: coxæ and femora bright orange, tips of latter narrowly blackish brown, remainder of legs dark blackish brown. Hind tibiæ only with a narrow pale yellowish ring immediately beyond the base. *Wings* orange-yellow; the apical part as far inwards as the whole of the outer marginal, submarginal and 1st and 2nd posterior cells, brown; the colour absolutely demarcated proximally by the veins delimiting these cells, but extending, more indistinctly, into the discal cell and posteriorly, also indistinctly, into the 3rd and 4th posterior cells. Halteres orange.

Length 16 millim. to tip of ovipositor.

Redescribed from two females in the Indian Museum from Bhim Tal, 4500 feet, Kumaon district, 19–22. ix. 06 (*Annandale*).

The two examples examined are exactly similar, except that the

abdomen of one has a little more blackish colour than that of the other. Dr. Annandale says that one of the specimens was seen by him to be laying eggs in the hollow of a tree.

200. (?) **Pselliophora serraticornis**, *Brun.*

Pselliophora serraticornis, Brunetti, Rec. Ind. Mus. vi, p. 242 (1911).

? ♂. *Head* brownish yellow, vertex a little tinged with grey. Palpi blackish. Antennæ very conspicuous: scape brownish yellow, 1st joint a little over twice the length of the 2nd; flagellar joints very deeply serrate on underside in the shape of two pendent lobes to each joint, of equal size and length, the proximal one black, the distal one brownish yellow; the last flagellar joint (11th) has a conical tip, with a small distinct apical style; each joint bears a verticel of hairs (four in number) at its base. *Thorax* brownish yellow, more yellowish anteriorly, with three darker dorsal stripes; the median one rather broad, and bisected by a narrow dark brown line, with which all the stripes are rather sharply delineated. Two spots behind the suture of similar colour and delineation, of normal shape, the anterior one approximately rounded, the hinder one more oblongo-triangular. Pleuræ a little greyish. *Abdomen* brownish yellow; the segments with blackish markings on the hind margins towards the sides (the apical half of the abdomen is wanting). *Legs*: coxæ and femora brownish yellow; tibiæ and tarsi dark brown or blackish. *Wings* pale grey, base and costal cell yellowish; stigma dark brown but ill defined, and a brownish suffusion, irregular in extent, below the stigma extending around the discal cell; also in less distinct manner, at the base of both basal cells, at the origin of the 2nd longitudinal vein and over the posterior cross-vein, and here and there over some of the veins. Halteres brownish yellow.

Length 12 millim. (incomplete).

Described from a single example in excellent condition (except for the loss of the apical half of the abdomen), taken by Felder in 1861, in Ceylon.

Type in the Vienna Museum.

The end of the abdomen being broken off, the sex of the specimen is undeterminable. The species is a very conspicuous one and, as regards the antennæ, quite unlike any other that I have seen or read of. The abdomen, so far as the middle, shows no trace of any increase in width. It may not be a *Pselliophora*, but the antennæ cannot by any stretch of imagination be associated with *Tipula*, yet the flagellum is distinctly verticillate, an essentially Tipuline character.

Section *TIPULINI.*

Although, as has been mentioned, several abnormally constructed forms belong to this section, approximating in some degree to the CTENOPHORINI, none of these have as yet occurred in the Orient. *Tipula* and *Pachyrhina* alone represent this group in the East, these, moreover, being the two most representative genera of the section. Little can be added to the characters already given in the preceding table of sections.

The colours in *Tipula* are comparatively sombre, consisting mainly of various shades of browns, yellows and dull blacks, whilst in *Pachyrhina* the species are generally bright yellow with black, well-defined markings.

Some European species are mainly black, with yellow markings, one or two of this nature having been described from the East, but not from India.

Genus **TIPULA**, *L.*

Tipula, Linné, Syst. Nat. Ed. x, p. 585 (1758).
Anomaloptera, Lioy, Atti dell Istit. Veneto (3) ix, p. 218 (1863).
Oreomyza, Pok., Wien. Entom. Zeit. vi, p. 50 (1887).

GENOTYPE, *Tipula oleracea*, L.

Head more or less oval. Proboscis moderately long, comparatively broad, the upper part prolonged narrowly in the form of a nasus or nose, the lower part bearing well-developed hairy labella at the tip; palpi four-jointed, long, cylindrical, the last joint whiplash-like, as long as the preceding three joints taken together. Eyes separated by a frons of one-third to one-fourth the width of the head in both sexes, rarely a little wider in the female. Vertex slightly, sometimes considerably arched. Antennæ of thirteen joints, long, generally a little longer in the male than in the female; 1st scapal joint elongate, cylindrical, 2nd very short, not wider than the 1st scapal or 1st flagellar joint flagellar joints cylindrical, often slightly enlarged at their bases, sometimes very slightly contracted just before their tips; 1st joint always considerably longer than the others; each flagellar joint bearing four verticillate hairs, the two on the upperside long and divaricate, those on the underside much shorter; scapal joints never verticillate, but bearing some short bristly hairs at the tip of each joint, often a long hair or two in addition. *Thorax* arched, practically bare, more or less elongate in front, produced into a short conical neck. Transverse suture distinct. Scutellum moderate in size, semicircular; metanotum highly developed. *Abdomen*, irrespective of the genital organs (which form the 9th), of eight segments; cylindrical in the male or more or less incrassated at the tip, or entirely linear throughout

its length if the genitalia are small. In the female, rather more flattened, generally a little broader, especially towards, but not actually at, the tip. Genitalia of male nearly always large and complex, of varied structure according to the species, consisting usually of a moderate-sized dorsal plate, a large curved or V-shaped ventral plate, and more or less developed side plates (often invisible, possibly absent); a pair of stoutly built conspicuous, two-jointed claspers, the second joint taking the most varied forms; and inner organs of varying form according to the species, with a long filamentous penis, generally concealed. In the female the genital organs reduced to the normal pointed pair of horny valves, the lower pair much shorter, set much further back at the base and sometimes twisted round a little towards the side. *Legs* very long and slender, especially the tarsi, which are generally longer than the tibiæ; tibiæ with small spurs at the tip; claws and pulvilli small. *Wings* elongate, of moderate width; tip narrowed, sometimes almost pointed; anal angle generally but not always narrowed. One marginal, two submarginal, and five posterior cells. Auxiliary vein ending always some distance beyond the middle of the wing; the 1st longitudinal a little longer, turning into the 2nd at its tip, the auxiliary turning down into the 1st; costal cross-vein often placed at such an angle as to make it appear like the continuation and end of the 1st vein; the 2nd vein emerges in a gentle curve, sometimes some little way before the middle of the wing, sometimes distinctly beyond it, the anterior branch always oblique; the 3rd vein issues shortly before the middle of the 2nd vein, the distance between its origin and the forking of the 2nd vein differing according to the species. Sometimes there is no obvious basal section to the 3rd vein; sometimes it is longer than the nearly upright anterior cross-vein, with which it is usually in a line. Discal cell invariably present, pentagonal, of moderate size; the 2nd posterior cell always petiolate, the petiole varying in length with the species but by no means constant in the same species. The posterior cross-vein very oblique, nearly always at the fork of the lower branch of the 4th vein, which forking occurs somewhere on the hinder side of the discal cell; occasionally the cross-vein occurs a little before the furcation, in which case it allows of the ultimate (5th) posterior cell coming into contact with the discal cell; except in these latter cases the contact of the 5th posterior cell with the discal is only punctiform. The 5th longitudinal vein nearly straight or angled at the junction with the posterior cross-vein; 6th vein nearly straight, lying comparatively close to the 5th; 7th rather short, nearly or quite straight.

Range. World-wide.

A character greatly helping to distinguish this genus from *Pachyrhina* is the furcation of the lower branch of the 4th longitudinal vein. This occurs beyond the base of the discal cell, the posterior cross-vein being situated at the fork. Thus, of the

two portions forming the posterior or hinder side of the discal cell, the proximal one abuts on the 2nd basal cell, and the distal one on the penultimate posterior cell.

Table of Species of Tipula.*

Table of Groups.

Wings either very conspicuously marked, or else the species distinguished by great size, at least 20 millim.	Group 1.
Wings either not conspicuously marked (if comparatively large species), or if so, then less than 20 millim. in extreme length (from tip of nasus to tip of genitalia).	
Wings distinctly marmorated	Group 2.
Wings with a few lighter and darker patches, or spots; never uniformly unicolorous. .	Group 3.
Wings practically or actually unicolorous . .	Group 4.

Group 1.

1. Tibiæ and tarsi with distinct whitish rings.	2.
Tibiæ and tarsi without any whitish rings.	4.
2. Femora with a whitish ring near tip; wing-marks practically confined to the costa, wing-tip and cross-veins	3.
Femora without any whitish ring; wing with various brown markings of quite a different pattern to *venusta* and *gracillima*	*patricia*, sp. n., p. 313.
3. Length 28 millim.; antennæ yellow, black at base of each joint; cross-veins suffused with brown, a moderate-sized brown spot at wing-tip	*venusta*, Walk., p. 302.
Length 17–18 millim.; antennal scape yellow, flagellum wholly black; cross-veins absolutely clear; apical spot much smaller, black	*gracillima*, sp. n., p. 302.
4. Wings unicolorous or practically so, but generally with characteristic markings. (Species with wholly clear wings not included in this section.)	5.
Wings not unicolorous	10.

* The present table of species of *Tipula* is a rather hybrid one, as it is impossible to arrange them either satisfactorily or intelligibly in one unbroken sequence. An absolutely arbitrary method is therefore perforce adopted, at least temporarily, and the species roughly grouped in four divisions, which, in a general way, are sufficiently distinct for the present study of them. This table must be regarded more as a guide to the different species than an absolute differentiation of them. *T. vicaria*, Walk. (p. 332) is not included in the table.

5. Ground-colour of thoracic dorsum mainly yellowish (three darker stripes present or not)	6.
Ground-colour of thoracic dorsum dark brown (sides yellow in *dives*)	9.
6. Thorax with the usual three darker stripes which are often contiguous	7.
Thorax wholly orange-yellow, unmarked. .	*flava*, Brun., p. 308.
7. Sides of thorax yellowish; a very distinct dark brown lateral stripe from neck to root of wings	*fulvolateralis*, Brun., [p. 304.
Sides of thorax yellowish, no dark side stripe	8.
8. Wings uniformly moderately pale brown, the obliterative streak almost imperceptible; 5th vein not distinctly suffused.	*majestica*, Brun., [p. 303.
Wings less dark brown, obliterative streak very pronounced, the wing just beyond it distinctly darker; 5th vein distinctly narrowly suffused	*princeps*, Brun., p. 306.
9. Sides of thorax dark brown, with pale yellow lateral stripe	*fumipennis*, Brun., [p. 305.
Sides of thorax yellowish, a dark brown stripe from neck to base of wings	*dives*, Brun., p. 307.
10. Ground-colour of wings not clear	11.
Ground-colour of wings practically all clear	12.
11. Antennal flagellum not serrate	*fumifasciata*, Brun., [p. 308.
Antennal flagellum distinctly serrate on underside	*serricornis*, sp. n., [p. 309.
12. Thorax conspicuously marked, apart from the usual three stripes	13.
Thorax without conspicuous marks, but the usual three stripes present	*fuscinervis*, sp. n., [p. 312.
13. Wings broader, markings mainly in the form of spots. Thorax with chalk-whitish grey stripe towards each side of the dorsum	*pulcherrima*, sp. n., [p. 310.
Wings distinctly narrower, markings mainly in the form of longitudinal dark streaks. Thorax without any chalk-white stripe	*splendens*, sp. n., p. 314.

Group 2.*

Species with "marmorated" wings, under 20 millim. long.

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* It is quite beyond the bounds of possibility to tabulate the very closely allied species in this group. A reference to the figures in Plate V, in conjunction with the descriptions, is necessary. The species are *reposita*, Walk., *himalayensis*, *tessellatipennis*, *robusta*, *marmoratipennis*, *quasimarmoratipennis*, *striatipennis*, *subtincta*, *elegans*, *griseipennis*, and *nigrotibialis*, all Brunetti.

Group 3.

(Intermediate between Groups 2 and 4.)

Length 23 millim.	*interrupta*, Brun., [p. 327.
Length 18 millim.	*nigroapicalis*, Brun., [p. 328.
Length 10 millim.	*continuata*, Brun., [p. 328.

Group 4.

1.	Species with some more or less conspicuous differential character	2.
	Species without any specially distinctive means of recognition	3. [p. 329.
2.	Wings tawny, brown spot at tip	*walkeri*, nom. nov.,* [p. 330.
	Body orange, velvet-like, head all black, dorsum of thorax deep red............	*melanomera*, Walk., [p. 330.
	Body grey, wings grey, a small but distinct darker grey spot near tip of 2nd basal cell and in middle of anal cell	*quadrinotata*, sp. n., [p. 331.
	Wings clear, thorax bright orange-yellow with seven very distinct dark grey spots.	*ornatithorax*, Brun., [p. 335.
3.	Legs mainly yellowish..................	4.
	Legs dark brownish yellow	*demarcata*, Brun.,
	Legs mainly black or blackish brown	7.
4.	Femora broadly blackish at tips, the colour sharply demarcated from the pale yellow tibiæ	*ochripes*, Brun., p. 334.
	Femora narrowly black-tipped, or unicolorous..........................	5.
5.	Costal cell of normal size..............	6.
	Costal cell very small, extending less than one-fifth the distance from proximal side of cell to wing-margin, along the upper branch of 4th vein; thorax distinctly brownish yellow; abdomen black, except yellow at base	*flavescens*, sp. n., p. 334.
6.	Thorax and abdomen soft yellowish grey; legs normal; stigma normal, filling all the inner half of the marginal cell; costal cell yellowish	*brunnicosta*, sp. n., [p. 332.
	Thorax yellowish; abdomen blackish; legs exceptionally thin; stigma filling only half the inner marginal cell; costal cell almost clear	*tenuipes*, sp. n., p. 333.
7.	In this section are five species, impossible to resolve into tabular form	*divisa*, Brun., p. 337. *gracilis*, Brun., p. 338. *munda*, sp. n., p. 336. *cinctoterminalis*, sp. n., [p. 338. *elegantula*, sp. n., p. 339.

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* For *T. fulvipennis*, Walk., preoccupied by De Geer in 1776.

201. **Tipula venusta**, *Walk.* (Pl. V, fig. 5.)*

Tipula venusta, Walker, List Dipt. Brit. Mus. i, p. 64 (1848).

"Rufo-fusca, subtus pallidior, thoracis dorso nigro univittato fulvoque bivittato, abdomine fulvo, disco rufo-fusco, antennis flavis nigro cinctis, pedibus nigris, tibiis albo cinctis, tarsis albis basi nigris, alis limpidissimis fusco subfasciatis.

"Head reddish brown; mouth yellow: palpi brown towards the tip; feelers yellow, beset with short black hairs, not more than half the length of the chest; base of each joint black; chest tawny; reddish brown on the disk, and having there a black stripe in the middle, and a tawny stripe on each side; the two latter communicate in front with the tawny colour of the rest of the chest; abdomen bright tawny, reddish brown on the back, excepting the base of each segment, which is tawny; legs black, very long; a broad white band across each shank; feet white, excepting the first joint; wings colourless, very transparent, having a large irregular brown spot near the tip, where some of the veins are also clouded; there is a small brown brand at the end of the first longitudinal vein, and beneath it a narrow interrupted brown line extends across the wing, and clouds the sides of some of the short connecting veins; veins very dark brown; poisers brown, tawny at the base.

"Length of the body 14 lines; of the wings 24 lines.

"Silhet. From the Rev. J. Stainforth's collection." (*Walker.*)

Type. Described from the British Museum collection, but no longer to be found there.

There are evidently several species in the East which are closely allied to this and to Wiedemann's *pedata* described from Java. None of the specimens seen by me could be actually determined as *venusta*.

202. **Tipula gracillima**, sp. nov.

♀. *Head*: frons and vertex pale yellowish, with a brown median streak, the frons becoming almost whitish over the antennæ. Proboscis and palpi yellowish white, tip of proboscis greenish. Antennal scape pale yellowish; flagellar joints cylindrical, black, well separated, at least those of the basal half; the verticillate hairs very short. Back of head brownish above, pale yellowish white below. *Thorax*: dorsum brownish yellow; a median narrow reddish brown stripe, which is not very pronounced, and an indistinct shorter stripe on each side of it, some distance behind the shoulders. The brownish colour of the dorsum is extended forward to the anterior margin of the thorax and along the short neck. Scutellum and metanotum brownish yellow. Sides of thorax pale yellowish white, with silvery white reflections, if viewed from certain directions. *Abdomen*: basal

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* A figure of a wing attributed to this insect was included in the Plate, as I believed I had found the species in the Indian Museum collection. Later studies lead me to think that I have not met with the true *T. venusta*, but the figure is allowed to remain as typical of this group of species.

segments very attenuated, the 3rd segment suddenly enlarging towards its tip, the 4th the widest, the remaining four decreasing gradually in width; the first two and the base of the 3rd pale yellowish, the remainder blackish. Each segment has a more or less interrupted narrow white or whitish band, which on the first four segments is placed in front of the middle, and on the last four segments is basal. Belly yellowish on basal half, blackish on apical half. Ovipositor rather complex: an upper short oblong plate, of the same appearance and colour as the last abdominal segments, beneath which protrudes a dark grey cylindrical piece bearing the upper pair of valves, which are blackish, narrow and somewhat curved upwards; the lower pair of valves are short, stout, reddish, and enclosed by a protecting sheath on each side rather shorter than the valves themselves, and of the same colour as the last abdominal segments. *Legs*: coxæ pale yellowish; femora dirty brown, darkening a little before the snow-white, narrow, subapical ring which precedes the very narrowly black tip. Anterior tibiæ all black, except for an apical snow-white ring, a little wider than that of the femora; hind tibiæ black, with two snow-white bands: the first, moderately wide, placed soon after the base, the second apical, forming one-third of the whole length of the tibia. The metatarsus a little longer than the tibia, the second tarsal joint between one-third and one-fourth of the length of the tibia, the remaining joints very short; the anterior metatarsi black, except for a broad apical white ring, the rest of the tarsus being also white; the hind tarsi have less than one-third of the metatarsus black, the rest of the limb being snow-white. In all cases, wherever the snow-white rings occur, the minute pubescence is slightly denser. *Wings* absolutely colourless. A dark blackish stigma, the colour of which extends very narrowly along the base of the 3rd vein; a small dark brown, rather sharply defined, apical spot, embracing the tip of the 2nd and 3rd longitudinal veins and the 1st posterior cell. Discal cell rather large, pentagonal; pedicle of upper branch of 4th longitudinal vein nearly as long as the terminal veinlets; the 7th vein very short, almost straight. The 1st longitudinal vein rather strongly black. Halteres blackish.

Length 15 millim., excl. ovipositor $2\frac{1}{2}$ millim.

Described from one female from Peradeniya, Ceylon, 20. vii. 10 (*E. Gravely*).

Type in the Indian Museum.

A very handsome and delicate species. The absolutely clear wings, without the slightest tinge of greyness, with the two dark spots in each, the well-defined snow-white rings on the legs, and the attenuated base of the abdomen, at once stamp this species as quite distinct from all others.

203. Tipula majestica, *Brun.*

Tipula majestica, Brunetti, Rec. Ind. Mus. vi, p. 248 (1911).

♂ ♀. *Head*: back of head light brownish grey, with a very

narrow median dark line. Frons and proboscis reddish brown, more greyish above in female. Palpi blackish, antennal scape and basal joints of flagellum yellowish red, rest of flagellum black; first three joints of flagellum elongated, remainder much shorter and slightly enlarged below in their centres. *Thorax*: sides and ground-colour of dorsum rich deep yellow ochre, bare; dorsum with a pair of median dark grey contiguous stripes forming the usual centre stripe, with a shorter outer stripe on each side, almost contiguous. The whole of the dorsum of the postsutural callosity occupied by a concolorous spot; the dorsum of the thorax just above the centre of the suture showing the bright yellow ground colour. Scutellum and metanotum dark grey, a narrow dark brown stripe joining roots of wings to the scutellum. Pleuræ gold-yellow, with shining yellow reflections in certain lights. *Abdomen* dark brown, microscopically pubescent; posterior margins of segments very slightly darker. In the female there is a tendency to a narrow irregular dorsal stripe, formed by the rather paler centres of the segments. Belly dark blackish grey. Genitalia of male consisting of a comparatively small dorsal plate bilobed almost to its base, narrower behind, with yellow hairs; a pair of claspers with a very large, approximately conical, black-haired basal joint and a much smaller scoop-shaped second joint, with yellowish hairs. The eighth ventral segment has its edge emarginate in the middle, bent in a sharp curve and clothed in that part with bright golden yellow hairs. Intermediate organs invisible. Ovipositor of female shining brown, with reddish tips. *Legs*: coxæ gold-yellow, rather shining, with a few hairs; femora and tibiæ brownish yellow, tarsi rather darker; tips of femora with a rather narrow black ring. *Wings* brownish yellow, veins of a little deeper colour. The centres of most of the cells on the posterior half of the wing rather clearer, and an indistinct transverse clear streak just before the hardly visible stigma. Halteres blackish.

Length 33 millim., excl. proboscis 3 millim., and ovipositor 3 millim.

Described from a male (*type*) and two females, all from Darjiling, 3-9. vi. 09 (*F. M. Howlett*), and a female (*type*) from Kurseong, 24. vi. 10 (*Annandale*); a further female in the Indian Museum from the Nilgiri Hills, 3500 ft., ix. 10 (*H. L. Andrewes*).

Type ♂ in the Pusa collection, type ♀ in the Indian Museum.

204. **Tipula fulvolateralis**, *Brun.* (Pl. VI, fig. 15.)

Tipula fulvolateralis, Brunetti, Rec. Ind. Mus. vi, p. 249 (1911).

♂ ♀. *Head*: vertex grey; frons one-fourth the width of the head, yellow, with a little grey. Proboscis yellowish, dark brown at tip and on underside, also the labella and the palpi. Antennæ yellow, brown towards the tips. *Thorax*: dorsum brownish grey, forming the usual three dorsal stripes which are nearly contiguous,

the middle one reaching the anterior margin and being just perceptibly divided in front, the outer ones short, not reaching the shoulders. Dorsum behind suture, scutellum and metanotum brownish grey. Sides of thorax rather bright yellowish, the colour extending round the front below the shoulders; a thin dark brown line on each side, below the yellow portion, separating it from the lower part, which is almost livid in the type but unicolorous yellow in the second specimen. *Abdomen* chestnut-brown. Underside light yellowish grey on basal half. Genitalia of male brownish yellow, pubescent, complex; a small dorsal elongate curved plate, bilobed on the posterior half; a pair of large claspers, two-jointed, the 2nd joint rather shorter, scoop-shaped; an internal pair of organs, sub-globular, with narrow stems; a ventral curved plate with a small semicircular piece cut away in the centre, closely pubescent around the emargination with golden yellow hairs. *Legs* brownish yellow, coxæ livid, with a few whitish hairs, tips of femora with a rather narrow black ring. *Wings* moderately dark grey, costal cell brownish yellow (in one specimen with a number of fine but distinct upright lines): stigma hardly distinct from the colour of the costal cell; a small, nearly hyaline spot just above the discal cell, of which the distal side is nearly double the length of the proximal; posterior cross-vein narrowly but distinctly suffused near its junction with the 5th vein. Petiole of 2nd posterior cell very short. Halteres blackish.

Length 31 millim. from tip of nose to tip of genitalia.

Described from several specimens of each sex. Type ♂ from Bhim Tal, 4500 ft., Kumaon district, 19–22. ix. 06 (*Annandale*); type ♀ from Mazbat, Mangaldai district, Assam, 11–15. x. 10 (*Kemp*). Other specimens in the Indian Museum from Dhikala, Garhwal district, base of Western Himalayas, 10. iii. 10; Mangaldai, North Assam, x. 1910 (*Kemp*); Kurseong, 23. vi. 10 (*Annandale*). Two specimens from Sikkim are in the Vienna Museum, whilst I am almost sure that I have seen it at Mussoori.

Types ♂ and ♀ in the Indian Museum.

205. **Tipula fumipennis**, *Brun.* (Pl. V, fig. 6.)

Tipula fumipennis, Brunetti, Rec. Ind. Mus. vi, p. 250 (1911).

♀. *Head* mainly dark brown, a little yellow around the base of the proboscis; dark grey on back of head, except a broad median brown part extending over the frons to the antennæ, which latter are yellowish brown; scape paler. Palpi dark brown. *Thorax*: dorsum dark brown, almost bare, and with the usual three black stripes: the middle one divided down its centre by a narrow pale line; the outer spots normal; behind the suture, a small yellowish spot on the base of each post-sutural elevation, the dorsum of which is darker brown; the sides of the thorax immediately below the dorsum are occupied by a distinct though rather narrow pale yellowish stripe; below this the pleuræ are lighter, shining brown, practically bare. Prothorax rather prominently divided from the

mesothorax by a deep suture. Scutellum and metanotum brownish yellow, with lighter reflections and some pale hairs. *Abdomen* uniformly shining dark brown, bare. Belly lighter, with a few light hairs. Ovipositor shining dark brown. *Legs*: coxæ light yellowish brown, with pale yellow hairs; femora and tibiæ yellowish; femora with a rather broad black ring at tip. *Wings* uniformly blackish brown; posterior part slightly lighter; veins blackish. Posterior cross-vein somewhat thickened and infuscated, a character in which the veins in the immediate vicinity appear inclined to partake. Discal cell distinctly longer than the petiole of the 4th vein, this petiole rather more than half the length of the terminal veinlets. Halteres blackish.

Length 20 millim., excl. proboscis 2 millim. and ovipositor 2 millim.

Described from one female in the Pusa collection, taken by Mr. F. M. Howlett at Darjiling, 3–9. vi. 09. I have a damaged specimen from Mussoori that I captured there in June 1909.

206. **Tipula princeps**, sp. nov.

♂ ♀. *Head*: occiput and frons blackish grey, with black hairs. Neck brownish yellow. Proboscis brownish yellow, with very short black hairs; palpi black. Antennal scape pale yellowish, 2nd joint very short; flagellum with oval joints, a little blackish at base, where they have two long hairs on each side. *Thorax*: dorsum soft light blackish grey, the usual stripes nearly contiguous and filling the surface; median stripe double; thorax behind suture concolorous, extreme edges of dorsum yellowish, as are the whole of the sides of the thorax and the metanotum, except the middle of the latter, which, with the scutellum, is concolorous with the thoracic dorsum. *Abdomen* of male rather dark brownish yellow; an elongated blackish spot, darker anteriorly, in middle of each segment, giving the appearance of a dorsal black stripe; a black line on each side of the abdomen, merging into the wholly black apical two or three segments. Genital organs mainly concealed, but the following points are visible: a blackish-brown plate, suddenly contracted to a point posteriorly; a large pair of dark brown, shortly pubescent claspers, the 2nd joint of which is conical, pale yellowish; the ventral portion of the 8th abdominal segment is large, V-shaped, with some quantity of long, bright golden-yellow hairs at its lower extremity. There is also a pair of curious large, pale yellowish-white, very thin, slightly curved, sharply pointed inner plates, apparently protecting and covering the second joint of the claspers. Some inner organs are just visible, but are too hidden to be properly observed. *Legs*: coxæ pale brownish yellow; femora at base of the same colour, darkening gradually to the tip, where there is a distinct though not well-defined, apical black ring; tibiæ and tarsi blackish or very dark brown. *Wings* pale grey; costal cell yellow as far as the tip of the upper branch of 2nd longitudinal

vein. Tip of wing above 4th vein, a small oblong spot (distinct but ill-defined) about the middle of the anal cell, and an irregular suffusion before the posterior cross-vein (which suffusion continues along the 5th vein to the margin of the wing), blackish. A clear streak over the 3rd vein extending forwards a little, and posteriorly to the inner side of the discal cell. Halteres blackish.

Length: ♂ 22 millim. (including proboscis); ♀ 34 millim. (including proboscis and ovipositor).

Described from a unique male and female taken by Dr. Annandale "at light" at Kurseong, 18–19. vi. 10.

Types in the Indian Museum.

207. **Tipula dives**, sp. nov.

♂. *Head*: frons and back of head blackish grey. Proboscis brown, a little yellowish below; palpi brown. Antennæ conspicuous; the scape and basal joints of the flagellum brownish yellow, remainder of flagellum dark brown; 1st scapal joint long, 2nd very short; 1st and 2nd flagellar joints cylindrical, 2nd rather shorter; remaining joints with their uppersides quite linear, the underside of each almost semicircular, giving a distinct serrated appearance. *Thorax*: dorsum rich dark olive-brown, the colour having a velvety appearance towards the margins and extending over the anterior margin, covering the prothorax. The usual three stripes (the median one distinctly divided) obvious but suppressed, rather dark greenish grey in colour. Behind the suture on each side are two similarly coloured spots, nearly contiguous, the first smaller and triangular, the hinder one nearly oblong; a small, almost bluish triangular mark behind the middle of the mesonotal suture; sides of thorax bright yellow; a dark brown line from the neck to below the base of the wing. Scutellum and metanotum concolorous with the ground-colour of the thorax; metanotum with greyish reflections. *Abdomen* blackish, with microscopic golden pubescence; dorsum of 1st segment rather broader, dark yellowish brown. Belly mainly black, but the base of the abdomen both at sides and on belly yellowish. Genital organs robust, consisting of an upper oblong plate, brown (blackish in middle), bifid posteriorly; a pair of large bright golden-brown claspers, minutely pubescent, the 2nd joint of which is comparatively small, conical, and nearly bare; the basal joint of these claspers is very distinctly keeled on the underside, and there appears to be no ventral plate. The claspers in the unique example present are closely folded, so that no smaller appendages are visible. *Legs* brownish yellow; the upperside of the femora distinctly blackish; tips of femora with a moderately broad black ring; tips of tibiæ and of each tarsal joint less conspicuously blackish. *Wings* uniformly moderately deep brownish yellow; the posterior cells and the whole wing posterior to the 5th vein,

a little clearer; a distinct clearer streak above the base of the discal cell and extending downwards to it. Halteres black.

Length 24 millim. to tip of nasus.

Described from a unique male from Kurseong, 23. vi. 10 (*Dr. Annandale*).

Type in the Indian Museum.

The resemblance that this species has to my *T. fulvolateralis* is most striking, especially in the bright yellowish sides to the thorax with the distinct lateral brown stripe, combined with the large size of the species.

208. **Tipula flava**, *Brun.*

Tipula flava, Brunetti, Rec. Ind. Mus. vi, p. 252 (1911).

♂. The whole body deep orange-yellow; palpi, labella, and antennæ a little darker. *Thorax* unstriped. *Abdomen*: genitalia consisting of a bilobed, oblong dorsal plate, a pair of claspers, of which the 1st joint is very large, obtusely triangular; the 2nd joint elongate-triangular; the whole organ concolorous. *Legs* concolorous, tips of femora minutely black; tips of tarsi a little darker. *Wings* pale grey, veins brownish yellow. Halteres brownish yellow.

Length 30 millim. (including proboscis).

Described from a single male taken by Mr. Fruhstorfer in Sikkim in March or April.

Type in the Vienna Museum.

209. **Tipula fumifasciata**, *Brun.* (Pl. V, fig. 7.)

Tipula fumifasciata, Brunetti, Rec. Ind. Mus. vi, p. 250 (1911).

♂ ♀. *Head* almost wholly yellowish grey. Antennæ: 1st scapal joint slightly contracted in middle, with a few hairs, 2nd very short; flagellum yellow, with microscopic whitish pubescence, and a verticel of four or five black bristly hairs at base of each joint. Proboscis and palpi yellow, both with short stiff black hairs. *Thorax* pale yellowish grey. The three normal dorsal stripes pale brownish grey, the median one abbreviated in front, and continued to the anterior margin only in the form of three very narrow lines. Sides of thorax pale yellowish grey, rather darker behind, with a slight brownish tinge behind the wings. Scutellum and metanotum very pale yellowish grey, almost with a greenish tinge. *Abdomen* light brown, with microscopic golden-yellow hairs, extreme bases of segments very narrowly black, posterior margins of segments narrowly pale yellowish. Genital organs concolorous, concealed, but large and apparently complex. *Legs* yellowish, tips of femora and tibiæ a little brownish; tarsi dark brown or blackish. *Wings* pale brown, a little darker on anterior half. Distal third of both basal cells nearly clear, the

hyaline part continued through the discal and 1st posterior cells to the wing-margin. A narrow, irregular clear streak transversely across the marginal cell, just beyond the barely obvious, small blackish stigma, which clear streak joins the clear part of the 1st basal cell. Veins brown, 3rd and 5th longitudinal veins, and the posterior cross-vein connecting the 5th with the discal cell, deeply but narrowly suffused with dark brown. Pedicle of fork of upper branch of 4th vein nearly as long as discal cell. Halteres brown.

Length 15 millim.

Described from two males and one female (*types*) in the Indian Museum collection from Ukhrul, Manipur State, 6400 ft., taken by the Rev. W. Pettigrew in August 1908; also from a cotype female from Central China in the Vienna Museum.

210. **Tipula serricornis**, sp. nov.

♂ ♀. *Head* mainly brownish yellow, including palpi and antennæ, the former distinctly brown; the vertex much lighter, yellowish or yellowish grey, the frons being one-third the width of the head. The 1st scapal joint long, 2nd quite short; 1st flagellar joint three-fourths as long as the 1st scapal joint, but rather narrower, cylindrical, as is the scape; remainder of flagellar joints subtriangular, one of the angles pointing downwards, so that the upperside of the flagellum is practically level; very short stiff hairs along the dorsum of the flagellum, the joints below being quite bare. The length of the antennæ is distinctly less than twice the length from the back of the head to the tip of the proboscis. Nasus distinct, narrow, pointed. *Thorax*: pronotum rather well defined, brighter yellow than the rest of the thorax which is brownish yellow, except the dorsum, this being occupied by the usual three stripes and posterior pairs of spots, all of which are contiguous to one another, greenish grey in colour, nearly filling the dorsal surface. The colour extends to the scutellum and metanotum, but is there a little lighter and more yellowish and semi-translucent. A whitish band or streak is irregularly reflected in certain lights on the pleuræ from the pronotum to just below the wing-roots, and a similar band at a short distance below the upper one. *Abdomen* brownish yellow; a short brown streak at each side near the base; two or three apical segments in the male more or less blackish, the colour less conspicuous in the female. Genitalia inconspicuous, brownish yellow, not wider than the abdomen; a small dorsal plate ending in two stout finger-like appendages; a large basal joint to the claspers, the 2nd joint being apparently in the form of two leaf-shaped organs; a ventral plate can be seen, completely withdrawn within the abdominal cavity. In the female the genitalia reddish brown, shining; two pairs of stout valves, rather short. *Legs* uniformly brownish yellow. *Wings* yellowish or yellowish grey, stigma almost imperceptible;

petiole of 2nd posterior cell practically absent;* the two veinlets of the upper branch of the 4th longitudinal vein springing simultaneously from the discal cell, widely diverging. The 3rd longitudinal vein remarkably curved, ending just below the wing-tip. Halteres blackish.

Length: ♂ 24–26 millim. (including proboscis); ♀ 30–32 millim. (including proboscis and ovipositor).

Described from two males and two females in the Indian Museum from Naini Tal, Western Himalayas, taken May and June 1893.

A somewhat puzzling species. The antennæ resemble those of *Prionota*, Wulp (a genus from Java, comprising one species only) in the narrowness of the flagellar joints at their bases, but the species lacks the shorter, robust legs and the conical prolongation of the face, which are characteristic features of that genus. The absence of verticillate hairs on the antennal joints also constitutes a distinct variation from typical *Tipula*, but the venation, apart from the non-petiolate nature of the 2nd posterior cell and the remarkably curved 3rd longitudinal vein, is strictly *Tipula*-like.

211. **Tipula pulcherrima**, sp. nov. (Pl. V, fig. 8; Pl. VI, figs. 12, 13.)

♂ ♀. *Head*: frons and proboscis tawny brown. Vertex and back of head grey, with a wide dark brown median stripe reaching to base of antennæ. Antennæ reddish brown, the last few joints blackish; the 1st scapal joint in the male with linear indentations making it appear to consist of five short joints, 2nd scapal joint very short; 1st joint of flagellum rather longer; base of all joints with a small ridge-like expansion and a verticel of four rather short hairs. Palpi with the first two joints reddish brown, remainder black. *Thorax*: dorsum mainly on the margins and between the markings, dark olive-brown, with rich dark brown stripes and spots arranged as follows: the usual median stripe is formed by two parallel, almost contiguous, moderately narrow stripes, which are very slightly wider in front, where they attain the anterior margin, extending posteriorly almost to the suture; an elongated, much shorter, oval, very slightly curved spot on each side of this median double stripe; a circular small spot just behind the suture; and posterior to this another elongated oval spot reaching the posterior margin of the dorsum. All these spots are of the same colour, and are surrounded rather broadly by a light grey bordering, which occupies some considerable part of the dorsal surface. Scutellum brownish grey or brownish yellow if viewed from behind, with a broad blackish median stripe. Metanotum pale brownish yellow, with a small dark spot at its base, the hinder part being bare, shining, and darker brown. Sides of

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* It is only obviously present in the type male, in which it is extremely short, being reduced to a point in the other three specimens.

thorax mainly dark olive-brown, with a little silvery reflection; the margins of the various parts of the pleuræ lined with grey, and a yellow area immediately below the front part of the dorsum, extending to the wing-base. The whole dorsal surface of the thorax is covered with rather thick soft dark brown hairs, which become yellowish on the scutellum and metanotum. Sides of thorax with yellowish hairs. *Abdomen* of male cylindrical, yellowish brown, darker towards tip. In female shining blackish brown, bare, somewhat broadened just beyond the middle. Dorsum of segments mainly rather bright ferruginous red; the extreme side edges of the dorsal plates, when seen from in front, with a whitish reflection on the hinder part. Belly blackish. When seen from in front, there is (in the female) a whitish spot in the middle of each segment, thus forming a median white stripe. The hind margins of the segments are also narrowly whitish. Genitalia of the male very large and complex, yellowish brown, a little pubescent; a dorsal, gently curved, comparatively small, oblong, darker brown plate with rounded outer corners, cut away in the middle of the posterior margin, the resultant inner corners being produced into distinct elongate black points; this plate continued narrowly down the sides, where it enlarges somewhat into a small oval terminal side-plate, immediately in front of the large ventral plate which is V-shaped, very large, extending upwards on each side of the genital chamber, thus forming large side-plates. The posterior upper corners are prolonged into approximately quadrate, comparatively small, black plates which meet and unite (apparently); leaving an open space below, through which protrudes a thick pointed plate of moderate size, with a faint dorsal dividing line. The claspers are large, consisting of a strong short obtuse basal joint and a second joint which is thin, broad, somewhat twisted, and broadly bilobed at the tip, with a small pointed, apparently stiff, projection on the inner side, and in addition some kind of a black hook. In the interior of the genital chamber can be seen a pair of organs apparently with black hooked tips, and in the centre a long cylindrical piece terminating in a very fine filamentous penis. Ovipositor shining dark brown, lower pair of valves much the shorter of the two, tips whitish. *Legs* comparatively short and thick, dark olive-brown, shining, with a few pale yellow hairs; femora and tibiæ brownish yellow; a very indistinct narrow dark ring near tip of femora; the tips of the tibiæ narrowly blackish; tarsi darker. The whole of the legs, except the coxæ, having a bare appearance; a few very short hairs near tips of femora, and the tibiæ with two strong short black spurs. *Wings* pale yellowish grey, costal cell distinctly yellow. Below the subcostal cell are four black spots: the first covering just the bases of the two basal cells; the second just beyond, confined to the 1st basal cell; the third circular, confined to the 1st basal cell, and placed on the origin of the præfurca; the fourth of rather large size, below the tip of the subcostal vein, to the inside of, and also below and contiguous to, the black circular stigma. Nearly all the veins

a little infuscated, except the subcostal (auxiliary) and the 2nd longitudinal, which are both yellow; the 5th also distinctly yellow towards its tip, as also the posterior cross-vein; the tips of most of the veins bear a distinct but small dark grey spot; the apical part of the costa infuscated, rather broadly so about the upper fork of the 2nd longitudinal vein; a rather clear spot on the posterior margin of the wing, at each extremity of the axillary cell. Discal cell hexagonal; upper branch of the 4th longitudinal vein nearly as long as discal cell and half as long as the terminal veinlets; 2nd longitudinal vein originating about the centre of the wing. Halteres brownish yellow.

Length 30 millim., excl. nasus 3 millim., and ovipositor 3–4 millim.

Described from a single type male taken by Mr. A. D. Imms near Bhowali, 5700 ft., Kumaon, Western Himalayas, 27. vi. 10, at light; a type female taken by the same collector in the same locality, July 1909; a second female from the same collector and locality, 26. vi. 10; and a third female in the Pusa collection, taken by Mr. F. H. Howlett at Darjiling, 3–9. vi. 09.

Types, ♂ and ♀, in the Indian Museum.

A very handsome and striking species, which bears some resemblance to a *Ctenophora*. As, however, the antennæ are distinctly verticillate, I retain it in *Tipula*; though it presents various characters which are rather more in keeping with *Ctenophora*, such as the comparatively stout and short legs, the tarsi being shorter than the tibiæ and the metatarsus only equal to the remaining tarsal joints, the slight enlargement of the abdomen just beyond the middle, and the slightly abnormal shape of the antennal joints.

212. **Tipula fuscinervis**, sp. nov. (Pl. V, fig. 9.)

♀. *Head*: occiput, frons, proboscis, and palpi brown, antennal scape yellow, flagellum brown. *Thorax*: dorsum grey, with the three usual brown stripes, rather narrowly separated, the middle one reaching the anterior margin, divided in front; the side stripes short, pointed in front. Post-sutural dorsum all brown, also the scutellum; metanotum grey, dorsum brown; edges of thoracic dorsum grey. Sides of thorax yellowish, pleuræ pale olive-grey. *Abdomen* light brown, blackish towards the tip, with traces of a dark dorsal stripe. Belly dark brown; ovipositor small, shining, dark brown. *Legs* yellowish brown; femora lighter, with a narrow black ring at tip; coxæ concolorous with lower part of thorax. *Wings* pale grey; veins blackish brown, yellowish here and there, narrowly suffused with brown in some places, especially at the junctures of the cross-veins and on the 5th longitudinal vein. Costal and marginal cells yellowish; stigma barely darker, not distinct. Obliterative streak very distinct below the stigma, ending in the discal cell, almost extinguishing the veins in its path, including the upper and lower sides of the discal cell.

Length (extreme) 30 millim.

Described from a perfect female captured by Dr. Annandale at Kurseong, 21–29. v. 06.

Type in the Indian Museum.

213. **Tipula patricia**, sp. nov.

♀. *Head* yellowish, closely tomentose on occiput. Eyes widely separated. Proboscis yellowish brown, palpi black. Antennal scape yellow, 2nd joint very short; flagellum black, the hairs normal. *Thorax* yellowish, rather brighter on the dorsum, on which are the three usual stripes, which are blackish and well separated, the median one narrowed anteriorly, culminating on the prothorax in a small round spot; behind the suture two blackish spots appear as the interrupted continuation of the outer stripes. Scutellum shining black, with two yellow-dusted spots at base; metanotum yellow-dusted, with a blackish shining median stripe. Sides of thorax yellowish. *Abdomen* black, rather shining, the sides continuously, and the posterior margins more or less narrowly, yellow. Belly yellowish white. Ovipositor reddish brown. *Legs*: femora yellowish, the tips broadly blackish; anterior tibiæ brownish towards the base, becoming nearly black at the middle, the distal half consisting of a white ring for two-thirds of this space and an apical black ring for the last third; hind tibiæ black, with a broad subbasal white ring and a wider subapical similar ring; tarsi all white, except at the base (broadly) of the metatarsus. All the white rings are very distinct, but without clear-cut demarcations. *Wings* pale grey; the terminations of the 4th longitudinal vein narrowly suffused; a blackish spot at the wing-tip, extending inwards over the distal half of the 1st posterior cell; a dark brownish suffusion about the stigma, reaching to the discal cell; a brownish spot across the middle of the two basal cells, and another over the posterior cross-vein. Costal cell a little yellow; 4th and 5th posterior cells and the wing posterior to the 5th vein a little darker grey. Halteres blackish.

Length 24 millim. (including proboscis and ovipositor).

Described from a perfect female captured by Dr. Annandale at Kurseong, 26. vi. 10.

Type in the Indian Museum.

This must be very near Wiedemann's *T. pedata* from Java (Auss. Zweifl. Ins. ii, p. 45), the differences in the body-markings being very slight. The brownish sides to the proboscis are not present, and the scutellum and metanotum differ from those of that species, though the legs agree very well. However, the wings do not fall in with what I should expect to find from the author's description, and as the present example comes from so different a locality, it seems justifiable to regard it as in all probability distinct.

214. **Tipula splendens**, sp. nov. (Pl. V, fig. 10.)

♂. *Head*: vertex and frons light grey, with a faint pinkish tinge; frons forming one-third the width of the head. Lower part of head from just below the flat nearly horizontal vertex dark brown, the colour sharply divided from the grey upper part. Upper and lower sides of proboscis concolorous with the upper and lower sides respectively of the head; palpi blackish. Antennæ with the scapal joints very light brown, the 1st joint with three lines of indentation making it appear as if four-jointed; flagellum yellowish, base of joints very narrowly black, verticillate. *Thorax*: of so many colours that it is difficult to speak of any one as the ground-colour. The margin of the anterior half of the dorsum moderately dark brown; a wide median yellowish-brown stripe (composed of two nearly contiguous ones), from the anterior margin to the suture, where it dwindles away to a point; the usual short outer stripes replaced by very conspicuous elongate chalk-white spots, with a dark chocolate-brown margin on each side; in front of these spots the surface of the dorsum is yellowish, much lighter than the median stripe; the whole post-sutural dorsum chalk-white, except the moderately narrow chocolate-brown margin, which is continued unbroken along the sides of the scutellum and metanotum. The scutellum chalk-white, the colour being continuous from the posterior margin of the thoracic dorsum. The transverse suture is a little brown about its middle, in front of which, just posterior to the end of the median yellowish-brown stripe, is a small shield-shaped whitish-grey spot. Metanotum grey, with a thin dark median stripe posteriorly. Sides of thorax, immediately below the dorsum, yellowish with a fawn or pinkish tinge; below this again, blackish grey with an intermediate, darker brown, irregular, ill-defined line dividing this colour from the yellowish upper part; pleuræ brownish or greyish. *Abdomen* brownish grey on first segment and on the last two or three segments; intermediate segments yellowish; at the sides, the lower edges of the upper plates of the abdomen frosted with white. Underside of abdomen dark grey, with numerous very small brown spots, from each of which a short stiff hair emerges. Sides with very soft short pale hairs. Genitalia dark brown; an oblong upper dorsal plate, with a groove in the middle above and a few yellowish hairs on the posterior margin; the basal joint of the claspers normal, of moderate size, apparently meeting below almost in the form of a ventral plate; 2nd joint of irregular shape, oval, crooked, and apparently composed of a pair of leaf-shaped processes; some intermediate organs are visible, amongst which are one or more hook-like (?) pieces. *Legs*: coxæ greyish, femora and tibiæ brownish yellow, tips of each indistinctly black, tarsi blackish. *Wings* almost clear, with longitudinal blackish streaks; costal cell and stigma brownish; a straight blackish streak, with ill-defined edges, along both sides of the 5th longitudinal vein from near its

base to the posterior cross-vein; a similar streak towards the tip, in the upper part of the 2nd basal cell; a third streak along the lower side of the discal cell, with fairly distinct edges, and reaching nearly to the wing-margin; a narrow streak along the apical half of the 3rd vein; other smaller streaks below the stigma, on the costa beyond the stigma, and along the 1st longitudinal vein just below the costal cell. Tips of all the veins with a small blackish spot, whilst there is a pale grey spot along the middle of the margin of the axillary cell between the 6th and 7th veins; the wing behind the 7th vein wholly grey; the veins, generally brown, are tinged here and there with yellowish. Halteres yellow, clubs black.

Length (entire) 28 millim.

Described from one male, in perfect condition, taken by Mr. A. D. Imms at Badrinath, 10,200 ft., Gahrwal district, 21. v. 10.

Type in the Indian Museum.

An exceptionally beautiful species of great size, and apparently quite distinct from any species described from the East.

215. **Tipula reposita**, *Walk.*

Tipula reposita, Walker, List Dipt. Brit. Mus. i, p. 67 (1848).

"Fulva, abdominis vittis duo apiceque fuscis, antennis fulvis nigro cinctis; pedibus rufo-fuscis, femoribus fulvis, alis fulvis maculis nonnullis limpidis.

"Allied to *T. nubeculosa*. Body tawny, a black ring round each joint of the feelers, which are not longer than the chest; a brown stripe along each side of the abdomen, whose tip is also brown; legs reddish brown; thighs tawny with brown tips; wings tawny; abdomen with five or six colourless spots, various in size and in shape and having also a brown spot near the tip of the foreborder; veins brown; some of the longest veins slightly clouded. Length of the body 8–10 lines, of the wings 16–18 lines. Nepaul." (*Walker.*)

Types, ♂ and ♀, in the British Museum; the male is in sufficiently good condition to be useful, but the female is reduced almost to a fragment.

I have seen no specimen which can possibly be ascribed to this species.

216. **Tipula himalayensis**, *Brun.* (Pl. V, fig. 11; Pl. VI, figs. 16 & 17.)

Tipula himalayensis, Brunetti, Rec. Ind. Mus. vi, p. 252 (1911).

♂ ♀. *Head* yellowish or yellowish grey, occasionally with a slight greenish cinereous tinge; a narrow fuscous stripe from behind the head, passing over the vertex, descending to just above the antennæ, where it forms an elongated spot. Antennal scape yellow; flagellum normally dark brownish black, with one or two hairs on each side at the base of each joint; each joint

being fairly long and slightly notched on the upperside just beyond the base. In some specimens the flagellar joints are shorter, and when this is the case they are generally mainly yellow, with a narrow black base; occasional intermediate forms, both in the matter of length of the joint and colour, prove that the differences are not specific. Proboscis brownish. Palpi more or less brown, first three joints subequal in length, 3rd the shortest; 2nd and 3rd stouter, 4th thin, twice the length of 2nd; all the joints moderately pubescent. Eyes black; frons at narrowest part barely one-third of head; back of head concolorous, with a few hairs, especially just behind, but not contiguous to the eyes, also on lower part. *Thorax* mainly yellowish grey, varying to ash-grey, often with a slight greenish tinge; dorsum with three stripes on anterior part, the middle one divided behind, reaching to the suture, and with a darker middle line in front; the outer stripes short, forming elongate spots, all three stripes greenish grey in colour; each post-humeral callosity bears three similarly coloured spots, an inner oval one, more or less in a straight line with the outer stripe in front of the suture, and two smaller ones just above the base of the wings; all the three spots being confluent in some specimens; shoulders more or less lighter grey, sutural emargination yellowish or greyish. Scutellum yellowish or yellowish grey, with a more or less distinct narrow median line; metanotum yellowish grey, hinder half more ash-grey, with an indistinct median line. Sides of the thorax usually concolorous, but always more yellowish than the dorsum. *Abdomen* variable; generally in the male the first five segments yellowish or yellowish brown, the remainder dull black, but the latter colour sometimes encroaches on the major portion of the abdomen, leaving only one or two basal segments yellow. In the female, yellowish or brownish, with three dorsal black lines, but the black colour is even more irregular in its extent in this sex than in the male, often covering nearly all the dorsum. In both sexes a narrow black line on each side of the abdomen, which is sometimes lost in the nearly wholly black abdomen in certain specimens. Male genitalia moderately large, concolorous, composed of an outer pair of firm conical claspers, the basal joint cut away somewhat on the outer side, the second joint comparatively large, with pointed tip; a narrow dorsal plate, with yellow hairs on its posterior margin; an inner pair of spoon-shaped organs bearing yellow hairs. Ovipositor of female very long (3 millim.), consisting of a long basal cylindrical piece, hard, shining, blackish brown, with at each side of it a grey plate with rounded edges, protruding from the last abdominal segment; these plates do not meet above or below; to the end of the basal piece is affixed a pair of long, pointed, slightly arcuated lateral valves, distinctly serrate on the underside; the lower pair of valves extremely short, and very liable to be overlooked unless closely searched for. *Legs* black; coxæ, knees, femora at the base, and a broad ring near the tip pale yellow. *Wings* yellowish grey, veins brown,

costal cell more or less yellowish. Clearer spots occur in the wings, generally towards the tip of the costal cell, at the base of and in the middle of the subcostal, surrounded by the stigma; a streak just beyond the stigma, extending backwards; a roundish spot on the posterior part of the distal half of the second basal cell, and sometimes small ones at the end of the 6th and 7th longitudinal veins, all these pale spots being more or less indistinct and ill-defined; the wing occasionally being nearly wholly clear, and having no yellow in it except in the neighbourhood of the costa. Stigma always brownish, of varying intensity. Halteres yellow, knobs black.

Length to tip of nasus: ♂ 11–14 millim.; ♀ 11–20 millim. (exclusive of the ovipositor).

Described from a good series of both sexes in good condition taken by me at Darjiling, 22.ix.08 to 1.x.08, in bushes on the hillside and attracted by the lamps in houses during the evenings. Frequently seen *in cop.* I also took several in the same locality from 10–20.x.05, and again from 23–29.v.10. The Indian Museum series comprises specimens from Bhim Tal, 4500 ft., 19–22.ix.08, and Naini Tal, 6400 ft. (*Dr. Annandale*). The species is probably common throughout the Himalayas.

Types, ♂ and ♀, in the Indian Museum; cotypes of both sexes are also in that collection and my own.

The species is variable, within certain limits, but can be easily recognised by the wide pale yellow ring on all the femora about as far from the tip as the width of the ring, a peculiarity I know of in no other Oriental species with marmorated wings, except *T. elegans.* I describe this species rather fully because it seems typical of a small set of very closely allied, but distinct, species frequenting the Himalayas. Three or four of these are present in the Indian Museum. Possibly *T. himalayensis*, or some of the allied species referred to, may prove identical with Palæarctic forms.

217. **Tipula tessellatipennis**, sp. nov. (Pl. V, fig. 13.)

♂ ♀. *Head* wholly pale brownish yellow, almost pinkish in the female on the broad vertex; labella of the proboscis black; palpi dark brown. Antennæ brownish yellow, extreme base of flagellar joints black. *Thorax* pale yellowish, with a greyish tinge; darker in male, which has a brownish-grey median stripe, darker at the edges and in the middle; the female with a yellowish median stripe, which has a brownish border on each side and a brownish median line. Two elongate oval brownish side spots, with a similar small one of the same colour on each shoulder; behind the suture, on each side of the dorsum, a small round spot and an elongate posterior one; the narrow brownish outer lines of the median stripe extending to the posterior margin of the dorsum; the sides and all the rest of the thorax pale yellowish grey, with whitish reflections when viewed from different directions. Scutellum and

metanotum rather greenish grey in male, pale yellowish grey in female. *Abdomen* of male brown, with an indistinct row of blackish dorsal spots. In the female the first segment distinctly pale yellowish grey, the remainder rather bright yellowish, and blackish towards the sides; dorsum blackish towards the tip. Belly yellowish, blackish towards the tip. Genitalia of male reddish yellow or brownish yellow; consisting of a wide squarish curved dorsal plate, with a longitudinal groove in the middle on the upperside, giving it the appearance of two plates joined together, terminating in the middle of the hind margin in two small black palp-like points, on each side of which, on the margin, are some sparse very short yellow hairs; the basal joint of the claspers very large, approximately triangular from a lateral point of view, reddish yellow; the second joint elongate, narrowly conical, moderately curved upwards; an inner pair of small organs with clubbed tips; the large basal segments of the claspers joined below, almost forming a ventral plate. Ovipositor reddish mahogany-brown. *Legs* brownish yellow, tips of femora and tibiæ blackish, tarsi blackish. *Wings*: ground-colour very pale grey, nearly clear; a little darker grey colour filling the costal cell and extending in three irregular moderately broad bands across the wing—the first beginning just beyond the humeral cross-vein, the second crossing the middle of the basal cell, the third beginning over the base of the 2nd longitudinal vein; the first two bands end in darker grey elongate spots in the anal cell, the third is hardly separable from the slightly darker grey tinge that fills the inner and major portions of most of the cells in the wing. The basal cell has a darker brownish streak towards its tip just above the 5th vein; the stigma is brown, the region below it a little darker grey; the discal cell, the fork of the upper branch of the 4th longitudinal vein, and the tip of the 3rd are all very narrowly infuscated; and also to a slight degree the tips of all the endings of the 4th vein. Pedicle of 2nd posterior cell about half the length of the discal cell, which is large. A distinct specific character is that there is a practically clear spot in the 2nd, 3rd, 4th, and 5th posterior cells, situated on the hind margin of the wing; the hind margin beyond the 5th posterior cell is also more or less clear. Halteres yellowish brown.

Length: ♂ 16 millim.; ♀ 24 millim. (including nasus and ovipositor).

Described from a single specimen of each sex received from the Lucknow Museum, taken at Naini Tal, 6400 ft., Kumaon, Western Himalayas, in May or June 1893.

Types in the Indian Museum.

Very near *T. himalayensis*, but easily distinguished by the absence of the pronounced subapical yellow ring on all the femora, and by the presence of the pale marginal spots in the 2nd, 3rd, 4th, and 5th posterior cells.

218. **Tipula robusta**, *Brun.*

Tipula robusta, Brunetti, Rec. Ind. Mus. vi, p. 254 (1911).

♂. *Head* dark grey; frons one-fifth the width of the head. Antennæ brownish yellow, base of joints very narrowly black. Proboscis and palpi dark brown, pubescent. *Thorax*: dorsum practically all blackish brown, with the exception of the suture, hind margins of the post-sutural callosities and a broad lateral and hind marginal border to the metanotum, all of which parts are reddish yellow. Metanotum with some short golden yellow hairs towards its sides, its dorsum dark grey; the median dorsal thoracic stripe attains the anterior margin and is slightly darkened on its edges. The prothorax is very distinct, brown, somewhat divided by a depression from the mesothorax; neck yellow. Sides of thorax light orange-yellow. *Abdomen* brown, 1st segment reddish yellow, 2nd reddish yellow on upperside, last segments blackish. Belly lighter brown, yellowish at base, tip blackish. Genital organs mainly dark brown, large and complex, but considerably concealed between the two large side-plates, apparently consisting of a small upper dark brown pubescent plate; a pair of pale yellow, flat, pointed organs; the usual pair of large claspers, each of which bears a brush-like appendage; and there are apparently intermediate organs also. *Legs*: coxæ yellow, with a few pale gold hairs; femora light brownish yellow, tips rather broadly blackish; tibiæ brownish yellow with blackish tips; tarsi yellowish brown, very long, hind pair nearly twice as long as the tibiæ. *Wings* pale yellowish grey, with darker brownish yellow parts, such as the costal cell, the major part of the 1st basal cell, a large area near the distal part of the 2nd basal cell, a squarish spot in the middle of the 6th posterior cell, the whole of the two submarginal cells, and the base of the 1st posterior cell; stigma yellowish brown, well defined; veins dark brown, 5th with a tendency to a narrow suffusion. Halteres brownish yellow.

Length (entire) 20 millim.

Described from one male in my collection from Mussoori, taken by me, 22. vi. 05.

219. **Tipula marmoratipennis**, sp. nov. (Pl. V, fig. 13.)

♀. *Head* yellowish; tip and underside of proboscis brown; palpi brownish yellow; antennal scape yellow, flagellum blackish brown; vertex with a narrow brown median line. *Thorax* moderately dark grey, with a median pair of dark greenish grey closely approximated stripes, an elongate spot on each side and a smaller round spot on the shoulder—all these marks bordered narrowly with dark brown; a pair of large oval greenish grey post-sutural spots and a narrow dark brown median line from a little behind the suture passing unbroken over the scutellum and metanotum. Scutellum yellowish grey, metanotum greenish grey. Sides of

thorax yellowish, with grey and greenish reflections when viewed from different directions. *Abdomen* rather bright reddish yellow on the first five segments, more or less blackish towards the sides; the whole dorsum of the remaining segments blackish. Pale yellow hairs on the hind margins and the sides of the segments. Belly mainly blackish, the central parts of the basal segments more or less yellowish; ovipositor small, reddish yellow; underside of abdomen somewhat swollen at the tip. *Legs* brownish yellow, femora with broad blackish tips, tibiæ dark brown, tarsi blackish. *Wings* very pale grey; costal cell and stigma yellowish; a little darker grey in the middle and towards the tips of both basal cells, over the origin of the 3rd longitudinal vein, at the tip of the lower branch of the 2nd vein, on the outerside of the discal cell, at the fork of the upper branch of the 4th vein, in the 5th posterior cell, and on the greater part of the wing behind the 5th vein; also slightly but distinctly darker at the tips of all the endings of the 4th longitudinal vein. Petiole of 2nd posterior cell very short. Halteres yellowish.

Length 14 millim., excl. ovipositor 2 millim.

Described from two females from Darjiling, the type taken by me 24. iv. 10, the second example by Mr. Paiva 7. viii. 09.

Type ♀ in the Indian Museum, also the second specimen.

Distinguished from *T. himalayensis* by the absence of the yellow subapical ring on the femora, and from *T. tessellatipennis* by the absence of the pale marginal spots in the 2nd, 3rd, 4th, and 5th posterior cells, and by the presence of the small infuscations at the tips of the endings of the 4th longitudinal vein.

220. **Tipula quasimarmoratipennis**, sp. nov. (Pl. V, fig. 14.)

♀. *Head* brownish yellow; a narrow median brown line on the vertex; tip and underside of proboscis, also the palpi, dark brown. Antennal scape yellow, also the basal joints of the flagellum, the remaining joints dark brown, some having traces of a little yellow at their tips. *Thorax* cinereous grey, with the three usual stripes mouse-brown; dorsum behind suture mouse-brown, a little paler about the suture and the edges; sides of thorax cinereous, a little yellowish here and there. Scutellum and metanotum cinereous grey, with an indistinct median black line. *Abdomen* yellowish, with a distinct dorsal uninterrupted blackish stripe. On one example there is a distinct black stripe on each side, but it is not obvious in the type. Belly blackish, a little paler here and there. The dorsum of the 8th segment is cut away to the base so that the dirty brownish yellow ovipositor appears to start from the 7th segment. The lower part of the 8th segment is complete. Apparently there is only one pair of valves, laterally placed, long, with serrated edges. *Legs* brownish yellow, femora broadly blackish, tibiæ and tarsi blackish brown. *Wings*: prevailing colour moderately pale grey; costal cell

yellowish but not conspicuously so; three dark brownish irregular small patches placed, (1) over the base of the two basal cells, (2) over the origin of the 2nd longitudinal vein, and (3) forming the irregularly shaped stigma; the tip of the wing is just perceptibly darker. Some slightly paler spots than the ground-colour are placed as follows:—along the posterior side of the 2nd basal cell; a similar, but smaller, distal one in the same cell; in front of, and just beyond the stigma; at the tips of the 6th and 7th veins, with an intermediate marginal one. None of the veins are really infuscated except the 5th, for a short distance in the neighbourhood of the posterior cross-vein. Petiole of 2nd posterior cell two-thirds as long as the discal cell and barely half as long as the veinlets enclosing the 2nd posterior cell. Halteres brown.

Length 18–19 millim., excl. proboscis 1½ millim., and ovipositor 4½ millim.

Described from a type female from Darjiling, 23. v. 10, taken by me; a second female from Kurseong, 9. ix. 09 (*Annandale*); and a third female taken by Mr. W. Pettigrew at Ukhrul, Manipur, 6400 ft.

Type in the Indian Museum.

Distinguished from *T. himalayensis* by the absence of the yellow rings on the femora, from *T. tessellatipennis* and *T. marmoratipennis* by the absence of both clear spots on the margins of the posterior cells, and of infuscations of the tips of the 4th longitudinal vein-endings.

221. **Tipula griseipennis**, sp. nov. (Pl. V, fig. 15.)

♂. *Head*: vertex and frons moderately dark grey, with short scattered black hairs; frons nearly one-third the width of the head. Proboscis and palpi dark brown. Antennal scape with 1st joint of considerable length, 2nd very short, both pale yellow; flagellum yellowish, base of joints narrowly black. *Thorax*: ground-colour ash-grey, with three broad darker grey stripes, each bordered with a narrow line of darker colour, the median stripe having also a pair of fine darker longitudinal lines; on the shoulders, in front of each of the outer dorsal stripes, a black spot in the small indentation usually found there; behind the suture, a large oval, and a smaller anterior round darker grey spot on each side of the median depression. Scutellum and metanotum ash-grey or a little darker, with short yellow hairs on the hind margin of the former, and scattered wholly over the dorsum of the latter; sides of thorax just below the dorsum yellowish; pleuræ and lower part of thorax ash-grey. *Abdomen* yellowish, with very short yellow hairs, becoming darker and more reddish towards the tip, sometimes blackish on the dorsum of the end segments; 1st segment with two large squarish blackish spots; a more or less obvious black stripe along the side of the abdomen. Underside yellowish, becoming blackish towards the tip. Genitalia

consisting of a large, square, black, slightly curved, dorsal plate, with bright yellow hair on the posterior margin, except just in the very centre; the outer side of the large basal joint of the claspers has almost the appearance of a side-plate; the second joint is a hook-like pointed reddish yellow piece, slightly curved; a pair of broad, thin, pale yellow processes issuing apparently from the lower part of the genital chamber, curving upwards side by side, closing up (so to speak) the genital chamber. Inside, below them, a narrow penis is observable; a ventral plate is present. *Legs* brownish yellow, coxæ slightly dusted with grey, femora and tibiæ each with a narrow black apical ring, tarsi blackish towards the tip. *Wings* pale grey, with nearly clear streaks and spots, placed as follows:—one, of irregular width, from the 5th longitudinal vein to the hind border of the wing, ending just behind the tip of the 7th vein; one across the middle of the 2nd basal and the anal cells, zigzag in nature:, a narrow clear streak, here and there less distinct, around the inner margin of the distal half of the 2nd basal cell; over the base of the discal and 4th posterior cells; beyond the stigma and, to a less degree, more or less distinctly before it; in the tips of the submarginal and 1st posterior cells (less distinctly), and a distinct semicircular spot on the wing-margin in the 2nd, 3rd, 4th, and 5th posterior cells; and finally two on the margin of the axillary cell. A little blackish suffusion over the base of the 2nd longitudinal vein; another forming the ill-defined stigma; another over the basal veins of the discal cell and the posterior cross-vein and about the middle of the anal cell. Halteres yellow, clubs blackish, tips yellowish.

Length 16 millim.

Described from two perfect males from Badrinath, 10,200 ft., Garhwal district, 27.v.10 (*Imms*).

Type in the Indian Museum.

A very distinct species, though closely allied to those of the *T. himalayensis* group, being nearest to *T. tessellatipennis*; yet when a couple of specimens of each are placed side by side, their specific distinctness is obvious at a glance. Still it is difficult to define the differences exactly, beyond noting that in *T. tessellatipennis* the wings have a very distinct *yellow* appearance whilst in *T. griseipennis* they are as distinctly *pale grey*, especially if viewed upon a dark background. The same applies to the colour of the thorax, which is yellowish in the former, grey in the latter species. Another difference, of perhaps less value, is that the two clear streaks in the middle of the wing extend forward in *T. tessellatipennis* up to the 1st longitudinal vein, but in the present species the first streak only extends forward to the 5th longitudinal vein, and the 2nd streak as far forward as the 4th vein. That they are quite distinct is certain.

222. **Tipula elegans,** *Brun.*

Tipula elegans, Brunetti, Rec. Ind. Mus. vi, p. 255 (1911).

♀. *Head* yellowish grey, more yellow at the back, from which a narrow, not very distinct, fuscous stripe runs over the vertex, but terminates before reaching the base of the antennæ. Nasus rather produced, pale yellow, with a pinkish tinge, and some yellow hairs at tip, pointing forwards. Frons one-fourth the width of the head; eyes black; palpi dark brown, pubescent. Antennæ: scape yellow; flagellum dark brown, the base of each joint narrowly black-ringed, and with one or two hairs on each side, the joints having a microscopic pale pubescence which gives a grey sheen when seen in certain directions. Proboscis dark brown, tip black. *Thorax*: dorsum brownish grey, with the three usual stripes shortened and confluent, thus forming a central spot of dark blackish brown, which in certain lights has a reddish tinge; two almost contiguous broad grey stripes (each darkened on its inner side) proceeding from the front of the dorsal spot to the anterior border of the thorax. Two dark reddish brown spots on each side behind the suture, the upper one circular, the hinder one oval: the hinder half of this latter one, seen from behind, bears a greyish sheen. A small yellowish cavity just below the shoulders. Prothorax more or less ash-grey, with slightly darker markings and a small brown streak on its upper part. Scutellum and metanotum very pale brown; posterior half of latter with ash-grey reflections, seen from behind, with a narrow, dark median line, as has also the scutellum; the scaly ridge in front of the base of the wings yellow; sides of thorax wholly pale greenish grey, with a whitish grey sheen in certain lights; a similar sheen on the elongated metapleura. *Abdomen* tawny yellow, with a median dark brown shining stripe, and a narrow side stripe, below which the extreme edges of the 2nd to the 7th segments are distinctly whitish on the posterior part. Belly pale yellow, with an indistinct median dark line. Ovipositor 3 mm. long; the first part shining black, cylindrical, with a whitish tip; the second consisting of two elongated red-brown sheaths; a reddish yellow ventral plate and an intermediate grey part apparently completes the genital apparatus. *Legs* almost exactly as in *T. himalayensis*, but more brown than black; the tarsi not much longer than the tibiæ. *Wings* generally resembling those of both *T. himalayensis* and *robusta* in appearance. Costal cell yellow, with only a single small clear spot near the tip; a wide pale brown band begins on the costa near the base, but only reaches the fifth longitudinal vein, and there is an irregular row of nearly clear spots from the base of the 1st basal cell hindwards to posterior margin of wing, one spot in each cell. The darker parts of the wing are slightly darker than in *T. robusta*, and the clear spots have a tendency to be still clearer, larger, and possibly more numerous. Halteres black, apical part of club pale.

Length (entire) 20 millim.

Described from a single perfect female in my own collection taken by me at Mussoori, 18. vi. 05.

223. Tipula nigrotibialis, sp. nov.

♂. *Head*: eyes considerably approximate, leaving a narrow frons, which, with the vertex, is dark grey, both with a narrow pale border. Proboscis dark yellowish brown, palpi darker, both moderately pubescent. Antennæ with the scape all yellowish; flagellum brownish yellow, verticillate, base of joints narrowly black. *Thorax*: prothorax rather conspicuous (though normal in size) owing to its detachment at the margin from the mesonotum; neck yellowish. Dorsum of thorax grey; a pair of median, rather well separated stripes, reaching the anterior margin, and the usual outer short stripes, all brownish grey; the usual large spots behind the suture present, but not very pronounced. Scutellum and dorsum of metanotum dark brown; sides of thorax rather bright yellowish, sides of metanotum dark grey. *Abdomen*: dorsum pale yellowish; an elongated dark grey spot with parallel sides on each segment (forming a dorsal stripe), widened on the posterior margin, the extreme edge of which is pale; a distinct black lateral stripe; the last two or three segments almost wholly blackish. Genital organs of moderate size but very complex; a rather large dorsal blackish oblong plate, with black hairs on the surface and edges, produced posteriorly into a narrow, elongate yellowish piece, ending in two palp-like appendages; basal joint of claspers very large, dark brown, blackish at base, bearing three pairs of appendages—(1) a whitish, obtusely conical 2nd joint; (2) a jointed obtuse piece ending in a long hard shining pointed portion, black at the base, the remainder reddish brown; and (3) a ridge-like projection of the underside of the basal joint itself, bearing dense yellow hairs; a ventral plate, very conspicuously keeled, enclosing yet another pair of clasper-like organs, thickly pubescent at the tips. The 8th sternite itself is distinctly V-shaped, bearing on each side of the angle of the V, near the hind margin of the segment, an elongate patch of thick yellow hairs. *Legs*: coxæ and the major part of the femora yellowish; femora towards the tips becoming dark brown or blackish; remainder of legs dark brown, nearly black on the tibiæ, tarsi a little lighter. *Wings*: ground-colour moderately dark grey; costal cell yellowish, the colour extending to the stigma, which is sharply delineated proximally by the "obliterative streak." The wing is much paler (though in no part is it quite clear) on the basal half of, and narrowly at the tip of, the 2nd basal cell; at the tip of the 1st basal cell and on a part of the marginal cell immediately above; also on the basal half (or thereabouts) of the discal cell. There is a crescent-shaped pale spot at the base of the 2nd, 3rd, and 5th posterior cells, and an elongate pale streak on the basal half of the anal cell, with a smaller one just beyond the middle. Discal

cell rather distinctly rectangular; petiole of 2nd posterior cell barely one-third as long as the cell. Halteres dark.

Length (entire) 18 millim.

Described from two males taken by me at Darjiling, 28. v. 10.

Type in the Indian Museum.

The second example, though undoubtedly belonging to the same species, has the thorax darker, and the blackish colour on the abdominal segments spreads over more than the apical half, whilst the legs are generally darker, especially the femora. In the wing the apical half of the posterior cell is pale, and the parts of the wing beyond the obliterative streak, towards the tip of the 2nd basal cell, and a spot in the middle of the anal cell, are distinctly darker brown. In the type these darker parts are clearly visible, but to a less extent.

This species is very near my *T. quasimarmoratipennis*, and they might at first sight be regarded as male and female of the same species. The differences, though not conspicuous, are quite constant in all the specimens before me, and have every appearance of being tolerably fixed characters.

In *T. nigrotibialis* there is no trace of a dark grey spot over the origin of the 2nd longitudinal vein, which is always present in the other species. On the other hand, all the ground-colour of the wing immediately beyond the obliterative streak, down to the discal cell, is distinctly darker than the general ground-colour of the wing; whereas in *T. quasimarmoratipennis* there is a distinct, nearly clear space immediately contiguous to the stigma. In the latter species the posterior cells are wholly grey, without any clear spots at the base, except where the obliterative streak sometimes encroaches on the base of the 1st or 5th cells.

224. **Tipula striatipennis**, sp. nov. (Pl. V, fig. 16.)

♀. *Head* rather dark ash-grey, shortly pubescent, with a median fuscous narrow stripe on the frons, continued to the back of the head. Antennal scape reddish yellow; 1st joint of flagellum long and black, next few joints reddish, remainder darker. Proboscis and palpi dark brown, hairy. *Thorax* mainly (with the sides) ash-grey, with short pale yellow hairs; dorsum darker, with the median dark stripe continued to the anterior margin; the two side spots smaller, narrow and well separated from the median stripe; the two post-sutural spots small. Scutellum and metanotum concolorous, with a narrow somewhat indistinct median dark line. *Abdomen* light brown, shining, with pale yellow pubescence and darker posterior margins to the segments; 1st, 2nd, and part of 3rd segments lighter brown. Ovipositor bright reddish brown, shining; the terminal points very narrow. *Legs* wholly dark brown. *Wings* pale grey, with threo obvious, but not sharply defined pale brown bands and an apical darkening which is not quite so distinct; the 1st band is basal, and reaches to the 5th

longitudinal vein posteriorly; the 2nd is immediately before the middle of the wing, and attains the posterior margin, where it widens; the 3rd begins at the stigma, follows the cross-veins, and continues along the 5th posterior cell; the apical darker part occupies about the distal half of the space between the cross-veins and the wing-tip. The bands are probably somewhat variable. Stigma dark brown, but ill-defined. Petiole of fork of upper branch of 4th vein as long as discal cell, distinctly shorter than the terminal veinlets. Halteres brown.

Length 10 millim.; without ovipositor ($1\frac{1}{2}$ millim.).

Described from a single specimen in the Indian Museum from Kurseong, 5000 ft., 6. vii. 08 (*Dr. Annandale*).

225. **Tipula subtincta**, sp. nov. (Pl. VI, fig. 18.)

♂. *Head* yellowish, slightly tinged with grey above near the edges, with short stiff yellow hairs; vertex with a narrow brown median line; underside yellow, with a round black spot at the lower corner of each eye. Proboscis yellowish, dark brown on underside and at tip, including the labella; palpi dark brown. Antennal scape yellow, flagellum dark brown, except the 1st joint (wholly) and the tips of some of the basal joints which are yellowish. *Thorax* yellowish grey, the three usual stripes greenish grey, the median one broad on the anterior margin (with a slight dividing line), narrowing to a point at the suture; side stripes in the shape of oval spots. Two similarly coloured spots on each side behind the suture, the anterior one round and the hinder one subtriangular. Scutellum and metanotum yellowish grey, a narrow indistinct black median line on both; sides of thorax yellowish. Some ragged bright yellow hairs round the posterior edges of the dorsum, over the post-sutural depression, and along the intervening spaces on the dorsum between the central dorsal stripe and the side spots. *Abdomen* yellowish for about the basal half, with a black dorsal stripe, the whole dorsum becoming blackish from the middle to the tip; dorsum, margins, and sides of each segment with very short yellow pubescence. Belly very similar to upperside. Genitalia moderately large and very complex, enclosed by two side plates, each bearing at least one long and one short tooth at the lower outer corner; the main joint of the clasper stout at the base and cut away posteriorly on the upperside, evidently of hard material; below this a long, fairly stiff, filamentous organ, and above the main joint, a palp-like smaller pubescent organ; enclosed between the two conspicuous claspers is a soft narrow organ, bilobed at the tip, with a strong large black horny hook on each side of it; the penis long, straight, bulbous at the base, slightly enlarged and pointed at the tip, bare; the whole of the other organs garnished wholly or here and there with yellow hairs. *Legs*: coxæ yellowish grey; femora yellowish towards base, remainder of legs mainly blackish brown.

Wings pale yellowish grey; costal cell brownish yellow, stigma brown; a just perceptible rather clear spot before, beyond and below the stigma; in the discal and 4th posterior cells; beyond the middle of the 2nd basal cell; and two or three other smaller ones (probably variable in number) in the anal and axillary cells. Halteres: stem brownish yellow, clubs black, tips brownish yellow.

Length (entire) 13 millim.

Described from a single male from Kurseong, 7. ix. 09 (*Dr. Annandale*).

Type in the Indian Museum.

But for the few isolated semihyaline spots in the wings this species would be classified with the "unicolorous wing" group. It seems, however, to be better placed here.

226. **Tipula interrupta,** *Brun.*

Tipula interrupta, Brunetti, Rec. Ind. Mus. vi, p. 256 (1911).

♀. *Head*: frons dark brownish grey, one-fourth the width of the head. Proboscis dark brown; palpi black. Antennæ yellowish, last joints blackish, with a few greyish reflections. *Thorax*: dorsum, scutellum and metanotum dark yellowish grey, with a little microscopic pubescence; the usual three dorsal stripes barely darker than the ground-colour; sides pale yellowish, bare; a little more orange immediately below the dorsum, from shoulder to wing base. Prothorax prominent, separated by a deep suture, brownish yellow. *Abdomen* blackish, with microscopic pale yellowish and dark brown close pubescence; bases of segments with a fairly wide, bare, shining blackish band, not very obvious but distinctly present. Ovipositor short, shining dark reddish brown. *Legs* brownish yellow; coxæ with a few soft pale hairs; femora and tibiæ narrowly black at tips. *Wings* pale yellowish; costal cell a little darker; veins blackish; the 5th longitudinal vein infuscated towards the tip and at its juncture with the cross-vein; stigma yellowish brown, occupying nearly half the marginal cell. A clear streak crosses the marginal cell, apparently cutting away the stigma abruptly, and crosses the proximal end of the discal cell, which latter is pentagonal. Halteres blackish.

Length 25 millim., without ovipositor (2 millim.).

Described from one female in the Pusa collection from Darjiling, 3–9. vi. 09 (*F. M. Howlett*).

Very near *T. fumipennis*, but differing by the absence of the distinct pale side stripe on the thorax just below the dorsum; by the lighter colour of the head and thorax; by the narrow (not wide) black tips to the femora; the yellowish instead of blackish brown wing; the absence of red on the dorsum of the abdomen; and by the pentagonal shape of the discal cell.

227. **Tipula nigroapicalis**, *Brun.*

Tipula nigroapicalis, Brunetti, Rec. Ind. Mus. vi, p. 257 (1911).

♂ ♀. *Head* cinereous grey, frons forming one-third the width of the head, with a not very distinct fuscous stripe, continued behind the vertex; underside more yellowish. Proboscis yellowish brown, with blackish tip; palpi blackish brown, both organs pubescent. Antennal scape and 1st joint of flagellum yellow, the remaining joints yellow, narrowly black at their bases, where there is a verticel of four hairs on each. *Thorax* cinereous grey, with the usual three dorsal stripes olive or greenish brown, the middle one reaching the anterior margin, the outer stripes in the form of elongated oval spots, almost contiguous with the median stripe; two post-sutural concolorous spots on each side in the shape of two triangles placed almost base to base. Scutellum and metanotum yellowish, with yellowish grey reflections if viewed from certain directions; sides of thorax yellowish; below the level of the wings, dark grey. *Abdomen* yellowish, with some soft yellow hairs, a dorsal and a lateral blackish stripe, last two segments black. In the female the last segment greyish, penultimate segment grey on underside. Genitalia very complex in male, but considerably withdrawn within the two side plates, which themselves appear to be furnished with a thick hook-like appendage each; in addition, at least two distinct pairs of organs, the larger pair being the usual claspers, conical, black; the other pair yellowish, flatter and with yellow hairs, a black edge and a strong brown inner tooth; a lower additional pair of black hook-like organs visible near the ventral plate, and there appear to be other organs not easily discernible in the present specimen. Ovipositor shining black, with shining reddish brown valves. *Legs*: coxæ and femora yellowish, the latter with a blackish ring at the tip; tibiæ and tarsi brownish or brownish yellow, tarsi darker towards the tips. *Wings* yellowish, a little iridescent in the male, rather paler at base of submarginal and 1st posterior cells, also in the middle of the 2nd basal cell, and irregularly, just before the stigma; costal cell rather darker; stigma yellowish in male, brownish in female, distinct but ill-defined; veins dark brown. Halteres black.

Length, ♂ (entire) 15 millim.; ♀ 16 millim., without proboscis (2 millim.).

Described from a type male and female, 16–20. x. 05, and two other females, 10–16. x. 05, all taken by me at Darjiling.

Types ♂ and ♀ in my own collection.

228. **Tipula continuata**, sp. nov.

♂ ♀. *Head* yellow, with a brown stripe from the neck to just above the antennæ. Scape yellow, flagellum grey, yellowish at base, a narrow black ring at base of each joint. Proboscis yellow, brown below; palpi brown, last two joints black. *Thorax*

yellowish, with short black hairs towards the margin of the dorsum; three very distinct stripes, the middle one attaining the anterior margin, with a superimposed black stripe which narrows to a point in front; the two side stripes brown, almost touching the median one a little behind the anterior margin. These stripes continue uninterruptedly across the sides of the upper surfaces of the scutellum and metanotum, both of which latter are otherwise greenish yellow, with a narrow brown stripe on the former; both being shortly pubescent, except down the centre. Sides of thorax yellow. *Abdomen* yellowish, with a little pale pubescence; 1st segment with a broad, ill-defined, median fuscous stripe; dorsum of last three segments brown; a narrow black stripe on each side of the abdomen, and the posterior margins of the segments with a tendency to paleness. Genitalia large and conspicuous; a convex, dark brown, bifid, dorsal plate; a V-shaped ventral plate, from each side of which projects a long, pale yellow, fleshy palp-like tentacle, with long bristles; the 1st joint of the claspers normal, the 2nd ending conically in a thick black point; the side plates small and narrow. In a specimen prepared for the microscope, the very long thin curled penis is easily visible, issuing from the large egg-shaped central vesicle. In the female the abdomen is rather dark brown, with an ill-defined blackish dorsal stripe, the abdomen less yellowish at the base, where the colour is chiefly confined to the sides. *Legs:* coxæ yellow; femora brownish yellow, tips black; knees yellowish white; tibiæ and tarsi dark brown. *Wings* very pale grey, with clearer spaces here and there, namely: towards the distal end of the 2nd basal cell, nearly the whole of the 6th posterior cell, and just above the tip of the 7th vein. Costal cell yellowish, stigma brownish, well defined; veins brown. Halteres yellow.

Length 9–10 millim., excluding the ovipositor (1½ millim.).

Described from four males and one female in the Indian Museum, all taken by me at Darjiling, 25–29. v. 10 and a male also taken by me at the same place, 16–20.x.05, in my own collection.

Types ♂ and ♀ in the Indian Museum.

Two males in the Indian Museum from Chitral, 9500 ft., Hindu Khush Mountains, 10. x. 10 (*Maj. F. Wall*), appear to be this species, though they show small differences which would probably come within a reasonable specific variation.

229. **Tipula walkeri**, nom. nov.

Tipula fulvipennis, Walker, List Dipt. Brit. Mus. i, p. 67 (1850).

"Fulva, thorace fusco trivittato, abdomine fusco fasciato, antennis fuscis, alis fulvis, stigmate fusco.

"Allied to *T. ochracea*. Body tawny, eyes black, feelers brown, tawny at the base, not longer than the chest; every joint furnished with a hair on each side; chest with a darker stripe on each side and a narrower brown stripe in the middle; back of the abdomen having a brown stripe, which is obsolete at the base and dilated

towards the tip; wings tawny, especially along the fore border, near whose tip is a brown spot; veins brown, poisers tawny.

"Length of the body 8 lines, of the wings 18 lines. Nepaul." (*Walker.*)

I have not met with this species, but as the name is preoccupied by De Geer in 1776 for a European species, I propose to rename it *T. walkeri*.

230. **Tipula melanomera**, *Walk.*

Tipula melanomera, Walker, List. Dipt. Brit. Mus. i, p. 68 (1850).

"Læte fulva, capite abdominisque apice nigris, thoracis disco rufo, antennis nigris, pedibus rufo-fuscis, alis subfuscis, stigmate obscuriore.

"Allied to *T. ochracea*. Body bright orange, velvet-like; head and its appendages black; disc of the chest deep red; tip of the abdomen black; legs dark reddish brown; hips orange coloured; wings pale brown, with a darker spot of the same colour near the tip of the fore-border; veins dark brown, poisers brown, orange at the base.

"Length of the body 8 lines, of the wings 20 lines. Nepaul." (*Walker.*)

231. **Tipula quadrinotata**, sp. nov.

♀. *Head* dark grey, with short black hairs above and behind; frontal space very narrow, about one-tenth the width of the head; eyes practically contiguous below. Antennal scape yellow, 1st joint long, 2nd very short; flagellum yellowish, with the bases of the joints black, and with a verticel of hairs. Proboscis reddish yellow, pubescent, tip dark brown; palpi black. *Thorax*: entire margin of dorsum light grey, the whole of the remainder of the dorsum occupied by two broad median stripes (separated by a very narrow pale line as far as the centre of the thorax), and a broad outer stripe on each side of them, practically contiguous; behind the suture the dorsum is likewise dark grey; sides of thorax yellowish, rather more brownish immediately below the dorsum. Scutellum dark grey; metanotum pale yellowish, with a greenish grey dorsum bearing some short golden yellow hairs. *Abdomen* brownish grey, with microscopic golden yellow hairs and a smooth blackish grey posterior border; dorsum of 1st segment yellowish. Belly greyish yellow, with short golden yellow pubescence. *Legs* brownish yellow, microscopically pubescent; tips of femora with a moderately broad black ring; tips of tibiæ very narrowly black; tarsi rather darker. *Wings* yellowish grey; extreme base and costal cell yellowish; stigma dark brown, apparently abruptly terminated at the proximal end by a clear obliterative streak running across the centre of the marginal cell, along the cross-veins up to and across the discal cell, whitening those veins in its progress; veins yellowish brown, but black in the vicinity of the discal cell. The 2nd basal cell with a small fuscous spot near its

end, just above the 5th longitudinal vein, and a similar one about the middle of the anal cell. Fork of upper branch of 4th longitudinal vein much shorter than discal cell and barely one-third of the terminal veinlets. Halteres blackish.

Length 24 millim., exclusive of ovipositor ($2\frac{1}{2}$ millim).

Described from a single female in the Indian Museum taken by the Rev. W. Pettigrew at Ukhrul, Manipur, Assam, 6400 ft.

This species answers tolerably well to the description of *T. infindens*, Walk., from Celebes, except that he does not mention the small but perfectly conspicuous fuscous spots on the wing, and that he speaks of the stripes on the thorax as "dull ochraceous." There is also considerable resemblance to Walker's *T. vicaria*, from the East Indies, and it is possible my species may be identical with one or the other.

232. **Tipula ornatithorax**, *Brun.* (Pl. VI, fig. 14.)

Tipula ornatithorax, Brunetti, Rec. Ind. Mus. vi, p. 258 (1911).

♂ ♀. *Head* tawny orange, tip of proboscis slightly darker; palpi and antennæ dark brown, scape of latter orange-yellow. *Thorax* uniformly tawny orange. On the dorsum are eight conspicuous bluish grey spots, narrowly edged with black, arranged as follows: two elongated, nearly contiguous, central ones (forming the usual median stripe) from the anterior margin nearly to the suture; on each side is a shorter one, nearly contiguous; a small circular one at the base of each wing, with a nearly contiguous elongated one posterior to it. Scutellum and metanotum of male light orange-yellow, concolorous with posterior part of thorax; in female, scutellum slightly brownish and metanotum with two very indistinct brown streaks. *Abdomen* of male blackish, major portion of dorsal surface of basal two-thirds tawny orange, with a small black spot towards each side of the base of the second segment; in the female, blackish, yellowish above at base, the colour showing a tendency to form a short dorsal stripe. Belly of male tawny, except the last three segments, which are blackish; in female, similar to the upperside but more yellowish, the posterior borders of the segments narrowly lined with yellow. Genital organs of male large and complex; a rather large squarish dorsal black plate, the posterior part bilobed, the hind margins with thick bright golden yellow hairs; two large blackish side plates, from within which protrude what are apparently the second joints of a pair of large claspers, conical and scoop-shaped, yellowish; an inner palp-like organ is attached to the second joint. In the female, the ovipositor is also large, dark shining brown, with a longer upper and shorter lower pair of yellow lateral valves. *Legs* yellowish brown, tarsi darker, extreme tips of femora and tibiæ blackish. *Wings* light grey; subcostal cell pale yellowish brown, ending in a pale similarly coloured stigma. Halteres blackish brown.

Length 20 millim., exclusive of proboscis (2 millim.) and ovipositor (4 millim.).

Described from a male in the Pusa collection from Darjiling, 3–9. vi. 09 (*Howlett*), and two females from Bhowali, Kumaon, 9700 ft., vii. 1909 (*type*) and 10. vii. 10 (*A. D. Imms*).

Type ♂ in the Pusa collection; type ♀ in the Indian Museum.

A specimen (subsequently broken) was seen by me from Kurseong, Darjiling, 21–29. v. 06 (*Dr. Annandale*), and the Vienna Museum possesses a female from Sumatra which may be this species or a closely allied undescribed one. The markings on the thorax are less distinctly outlined, and the whole insect is paler, with clearer wings.

233. Tipula vicaria, *Walk.*

Tipula vicaria, Walker, Ins. Saund., Dipt. v, p. 444 (1856).

♂. "Pallide cervina, cinereo tomentosa; antennæ setaceæ, subverticillato pilosæ, fusco fasciatæ, thorace multo breviores; thorax fusco subvittatus; abdomen fusco bivittatum; pedes ferruginei, longi, graciles, vix pubescentes, femoribus basi coxisque testaceis, tarsis fuscis; alæ cinereæ, apud costam subluridæ, fascia albida, stigmate fusco.

"Pale fawn colour, with cinereous tomentum. Antennæ setaceous, slightly verticillate pilose, with slender brown bands, very much shorter than the thorax. Thorax with indistinct brown stripes. Abdomen with two darker brown stripes. Legs ferruginous, long, slender, hardly pubescent; femora towards the base and coxæ testaceous, tarsi brown. Wings grey, somewhat lurid along the costa, with an incomplete whitish band by the stigma, which is pale brown; veins brown, tawny at the base and along the costa. Halteres tawny with brown tips.

"Length of the body 9 lines, of the wings 20 lines. East Indies." (*Walker.*)

Type in the British Museum; too damaged to be of any use for comparison.

The name *vicaria* was preoccupied by Walker himself in 1848 for a South African species, but as the type (British Museum) is in too bad condition for identification and no other specimen is apparently known, I refrain from setting up a new name, as it might be as well to let the species sink, since it would be extremely difficult, if not impossible, to set up a new type from the author's description.

234. Tipula brunnicosta, sp. nov.

♂ ♀. *Head* pale cinereous grey. Proboscis yellowish, palpi brownish, both hairy. Antennæ light yellow, base of each joint of the flagellum, except the 1st, narrowly black and bearing a

verticel of three longer hairs above and two shorter ones below. *Thorax* wholly pale yellowish grey; dorsum darker grey, without any admixture of yellow and without any distinct markings. Scutellum and metanotum similar. *Abdomen* of male yellowish, minutely pubescent; the two apical segments blackish above, the preceding segments very slightly darker on dorsum. Genitalia yellowish, large, conspicuous, complex, concolorous; enclosed by two large pubescent side plates; consisting of a pair of large fleshy organs, surmounted by a pair of small chitinous black hooked claws, and with a bunch of brush-like yellow hairs just above the ventral plate. In the female the abdomen is brownish yellow, minutely pubescent, with a narrow median, and a wider submarginal stripe; base of abdomen pale yellow. Belly yellowish, margins of segments well marked. Ovipositor light reddish yellow, shining. *Legs* yellowish, tarsi brownish, tips of femora barely darkened. *Wings* grey; costal cell distinctly brownish yellow, the colour continued to the apical half or third of the marginal cell, forming a stigma. Pedicle of fork of upper branch of 4th vein two-thirds as long as discal cell (male), or extremely short (female). Halteres dark brown.

Length 13–14 millim., exclusive of ovipositor.

Described from several specimens in the Indian Museum taken at Simla, 7000 ft., 11. v. 08 (*Dr. Annandale*), and some from Kalighat, Gahrwal District, W. Himalayas, 6000 ft., 4. vi. 10 (*A. D. Imms*).

235. **Tipula tenuipes**, sp. nov.

♀. *Head* blackish grey, the short nasus yellowish brown; antennæ yellowish brown, base yellowish, with two or three long hairs at the base of each joint. *Thorax* light brown above, nearly greyish on the underside; dorsum with the three usual stripes of rather darker brown and (divided from these by the transverse suture) two oval spots; between these markings, the almost pinkish brown ground-colour of the thorax can be seen. Scutellum with a narrow dorsal black line; metanotum unicolorous brown, with pinkish brown side edges. *Abdomen* light brown, with traces of a thin dorsal black line, and the posterior edges of the segments slightly edged with pinkish brown. Underside yellowish. Genitalia rather small, shining brown. *Legs* very slender; pale yellowish brown; tarsi darker; tips of femora and tibiæ black. *Wings* very pale grey, costal border yellowish. Stigma large and long, moderately pale brown, extending from the costa to the 2nd longitudinal vein. Halteres brown.

Length 16 millim., excluding ovipositor (2 millim.).

Described from a female in good condition in the Indian Museum taken at Sylhet (*Major Hall*).

236. **Tipula ochripes**, *Brun.*

Tipula ochripes, Brunetti, Rec. Ind. Mus. vi, p. 260 (1911).

♂ ♀. *Head* yellowish, vertex a little brownish grey in the middle; back of head similar. Proboscis blackish, robust and rather long; palpi blackish, with base and tips of first three joints more or less pale yellow. Antennæ rather short, blackish or very dark brown; tip of the long 1st scapal joint and the whole of the very short 2nd joint, pale yellow; base of 1st flagellar joint, which is long and cylindrical, sometimes yellow also; the remaining joints setaceous, much narrower at the base and tip on the underside of each joint; very minutely pubescent and with a verticel of very short hairs in the middle of each joint. *Thorax*: dorsum vandyke-brown, tinged with ochraceous here and there around the edges; with three narrow stripes, which sometimes appear as a pair of closely parallel lines, the stripe itself contained by them being practically concolorous with the dorsum. Scutellum and metanotum similar; sides of thorax, including the prothorax, yellewish; the colour rather distinctly marked off from the dorsum. *Abdomen* blackish brown, with microscopic pale yellow hairs. Sides and belly dusted with yellowish grey. *Legs*: coxæ yellowish; femora brownish yellow, tips broadly blackish; tibiæ and tarsi to their tips rather bright yellowish, sometimes the tibiæ a trifle more brownish yellow. *Wings* pale grey, costal cell brownish, brownish yellow or yellowish; a very slight dark brown suffusion over the juncture of the posterior cross-vein with the 5th longitudinal vein; stigma brownish, comparatively small; a pale streak obliterating the veins runs from in front of the stigma to beyond the discal cell, which it cuts just before or at the middle. Halteres pale, clubs darker.

Length, ♂ 18; ♀ 20–22 millim., excluding ovipositor (2 millim.).

Described from one type male from Kandy, 20. v. 10 (*Gravely*), one other male from Peradeniya, Ceylon, a type female from Kandy, 31. x. 09 (*Green*), and two other females from Kandy, v. 1907 (*Green*); all these being in the Indian Museum. One male in the Vienna Museum from Ceylon.

This species is near *T. vicaria*, Walk. The discrepancies appear to be that in Walker's species the abdomen has two darker brown stripes, the femora have no black rings at their tips, and the tarsi are brown. *T. vicaria* is described from the "East Indies," a term which Walker used to signify India. Walker's "incomplete whitish band by the stigma" I presume to represent my "obliterative streak."

237. **Tipula flavescens**, sp. nov.

♀. *Head* rather bright yellow; frons barely one-third the width of the head; back of head yellowish. Proboscis yellowish; palpi pale yellow, pubescent. Antennæ yellowish, pubescent, narrowly black at the base of each joint, where there is a verticel of hairs.

Thorax wholly brownish yellow, including scutellum, metanotum, and sides. *Abdomen* with the first segment yellowish, the remainder dark brown, with minute pale pubescence. Ovipositor shining reddish brown, long, the lower valves shorter and set further back than the upper ones. *Legs* brownish yellow; tips of femora narrowly black, tips of tibiæ more narrowly black, tips of tarsi blackish. *Wings* very pale grey; costal cell yellowish; stigma very faint, pale blackish; a small sub-hyaline space in front of it, extending over the costal and marginal cells (present in only one wing). Discal cell small, pentagonal, all the sides comparatively short; pedicle of fork of upper branch of 4th longitudinal vein about half the length of the nearly parallel veinlets. Halteres dirty yellowish.

Length 17 millim., without ovipositor (2 millim.).

Described from a single female from Hakgalla, Ceylon, 29. ix. 09 (*E. E. Green*).

Type in the Indian Museum.

238. **Tipula demarcata**, *Brun.*

Tipula demarcata, Brunetti, Rec. Ind. Mus. vi, p. 259 (1911).

♀. *Head* brownish yellow; frons dark grey or yellowish grey, about one-third of the head in width; in one specimen there are two small black spots on each side, contiguous to the eye margins, and connected thereon by a narrow black line. Proboscis brownish yellow; palpi thin, brownish yellow, darker at tip; labella blackish. Antennal scape yellowish, 1st joint with some black hairs at the tip, making it appear darker in colour, 2nd scapal joint very short; flagellar joints much elongated, brownish yellow or grey; base of each joint very narrowly black, a verticel of four hairs at the base of each joint, two hairs on the upper and two on the lower side. *Thorax*: dorsum mummy-brown (type) or yellowish; a narrow dorsal median dark brown line from the anterior border to the suture. Scutellum concolorous; metanotum pale semi-livid brownish yellow, moderately shining; sides of thorax very pale pinkish or whitish grey, the colour extending across the neck; it is sharply separated from the dark dorsum, the line of demarcation running from just above the shoulders to below the root of the wing, thence posteriorly to the metanotum. *Abdomen*: ground-colour brownish yellow, but the greater part of each segment blackish, including the sides, except on the sides of the basal segments. In one specimen, an indistinct pale yellowish narrow ring towards the base of many of the segments. A very narrow, more or less indistinct pale brownish yellow transverse line in front of the middle of each segment. Belly yellowish. Ovipositor brownish yellow, sometimes marked with black, normal, lower valves shorter than upper one. *Legs*: coxæ pale yellowish grey or pinkish grey, fore pair more yellowish, trochanters very pale yellow; remainder of legs dark brownish yellow; femora may

be darker or rather lighter, broadly blackish at tips; tibiæ and tarsi black. *Wings* very pale yellowish grey, costal cell yellowish, stigma brown, or the stigmatic region brown, merged proximally in the yellowish costal cell, the basal half of the marginal cell of the same colour as the rest of the wing. Discal cell pentagonal, rather small, the three upper sides forming a rectangle, the two lower sides forming a wide open "V": pedicle of upper branch of 4th longitudinal vein one-fourth as long as the veinlets. Halteres blackish.

Length about 15 millim., without ovipositor ($1\frac{1}{2}$ millim.).

Described from one female from Kandy, v. 1910 (*E. E. Green*), and another female from Peradeniya; also from a cotype in the Vienna Museum from Peradeniya, 25. xii. 01 (*Dr. Uzel*).

Type in Indian Museum; cotype in Vienna Museum.

239. **Tipula munda**, sp. nov.

♂ ♀. *Head*: frons one-fourth to one-fifth of the head, mouse-grey or dark grey; back of head dark grey, with minute black hairs on the region behind the eyes. Antennæ rather long, reaching back to about the suture; yellow, with the base of each joint of the flagellum narrowly black, and the usual one or two basal hairs on each side; scape moderately pubescent. Nasus, proboscis, and palpi brownish yellow, pubescent. *Thorax*, except the dorsum, pale yellow, with yellowish white reflections here and there, on the pleuræ, scutellum, and metanotum; dorsum pale yellowish grey, with a pale greenish tinge when seen from behind; the usual three central stripes, which are pale brown, the middle one (narrowly divided) reaching anterior margin; the usual two spots on each side behind the suture, the anterior one smaller and rounder, the hinder one larger and more oval. Most of these dorsal markings are almost invisible when viewed from in front. *Abdomen* yellow; 1st segment whitish on dorsum, with an elongated brown mark in the middle and a smaller one on each side. On the next five segments, a dark brown median line, with ill-defined edges, slightly more distinct on the posterior margins of segments, and carried upwards along the side of each segment, nearly to the fore border, thus giving the appearance of a lateral stripe: the absolute edges of the segments, however, distinctly whitish. Remaining segments black, except that these also have whitish edges to the sides like the anterior ones. The whole abdomen lightly covered with pale yellow hairs. Genital organs very complex. An upper curved protecting blackish plate, two triangular side-plates, and a sort of ventral pale yellow shield, bent inwards perpendicularly, with rather long yellow hairs; these various pieces enclosing two or three (or more) pairs of black, reddish, and pubescent organs, which are not sufficiently extended to describe, and surmounted by a small elongated reddish yellow process, bearing two short, black-tipped, palp-like prolongations; this process being apparently attached to the hind

margin of the upper protecting plate. *Legs* dark brown to nearly black; all coxæ and femora pale yellow for a short space at the base; tips of femora often blackish, and the knees more or less pale. *Wings* pale yellowish grey; stigma brownish yellow, occupying the distal half of 1st submarginal cell, from the centre of which runs the somewhat indistinct but obvious obliterative streak as far as the middle of the discal cell; costal cell yellowish. Halteres yellow at the rather thickened base, stem and club dark brown or blackish.

Length (entire) 18–20 millim.

Described from several males taken by me at Mussoori, 18. vi. 05, and six males and two females taken by me at Darjiling, 23–29. v. 10.

Type ♂ and ♀, with others, in the Indian Museum; co-type males in my own collection.

240. **Tipula divisa**, *Brun.*

Tipula divisa, Brunetti, Rec. Ind. Mus. vi, p. 261 (1911).

♂. *Head*: frons, at level of antennæ, nearly one-third the width of the head, yellow, as is the face and proboscis, sides of latter brown, with some short black hairs; palpi dark brown. Antennal scape yellow, second joint very short; flagellum black, each joint microscopically pubescent, rather elongated, and slightly swollen at base and towards tip, with a verticel of hairs just above the base; last joint very minute. Back of head yellowish, with some hairs. *Thorax* mainly bright chrome-yellow, bare; dorsum with the three usual stripes, of which the median one attains the anterior margin and is divided by a narrow line, being much less distinct than the outer shorter ones; these are somewhat velvet-brownish in colour. Post-sutural surfaces brownish yellow; a brown indistinct stripe from just below the shoulders to the middle coxæ. Scutellum, metanotum, and sides of thorax uniformly chrome-yellow. *Abdomen* shining brown, base yellowish; posterior margins of segments with a distinct, well-defined, pale yellowish-white border which bears pale yellow hairs; the rest of the dorsal surface bears rather thick short dark brown hairs. Anal segments dark brown. Genitalia dark brown; consisting of a strong upper piece, with two small pubescent appendages; two side plates, meeting on the underside, enclose a complex pair of large claspers, which bear terminal pale yellow pubescent finger-like processes, and a strong pair each of bifid black claws pointing upwards; a pair of yellow-haired, comb-like processes just below the large claspers. *Legs* (hind pair missing): femora brown, pale at base and blackish towards tips; knees a little pale; tibiæ and tarsi black. *Wings* nearly clear; costal cell and stigma brownish; 5th longitudinal vein slightly darkened; an indistinct hyaline streak from just in front of the stigma to the discal cell.

Length 11 millim.

Described from a single male in the Pusa collection, taken at Darjiling, 3–9. vi. 09 (*Howlett*).

241. Tipula gracilis, *Brun.*

Tipula gracilis, Brunetti, Rec. Ind. Mus. vi, p. 262 (1911).

♀. *Head*: antennal scape yellow, with a few hairs on the upperside; flagellum black, with microscopic grey pubescence and a verticel of hairs at base of each joint. Proboscis, palpi, frons, and back of head brownish yellow, with a few pale hairs on each side of the centre. *Thorax* ferruginous brown; the three dorsal stripes and a large one on each post-sutural callosity, all united; the suture very narrowly pale. Scutellum with the basal half yellowish, posterior half light ferruginous brown; metanotum and sides of thorax yellowish brown, with a little shining yellowish grey colour about the pleuræ. *Abdomen* dull black, with very short sparse grey hairs; yellowish at base, posterior border of segments whitish. Ovipositor shining black, terminal sheaths brownish yellow. *Legs* brownish yellow, microscopically pubescent; coxæ with a few short hairs; femora yellowish with black tips; tibiæ and tarsi dark brown. *Wings* yellowish; costal cell and stigma deep yellow, the latter distinct; an indistinct sub-hyaline streak from the inner side of the stigma to the basal half of the discal cell; 5th longitudinal vein on its distal part apparently double, forming a flattened triangle at its junction with the cross-vein connecting it with the 4th vein; 7th vein very close to hind border of wing, and parallel to it. Halteres blackish.

Length (entire) 12 millim.

Described from one specimen in my collection taken by me at Darjiling, 7. x. 05.

242. Tipula cinctoterminalis, sp. nov.

♀. *Head*: vertex blackish grey, with a narrow median darker line; remainder of head brownish yellow, sides and tip of proboscis darker. Antennæ brown, scape yellow. *Thorax* dark brownish yellow, the usual three dorsal stripes rather indistinctly delineated. Thorax below dorsum, the scutellum and metanotum yellowish. *Abdomen* blackish, base yellowish, hind margins of segments very narrowly grey, the 8th segment wholly yellowish grey. Ovipositor shining dark brown at base, the valves reddish yellow. *Legs*: coxæ pale yellow; femora brownish yellow, becoming nearly black at the tips; tibiæ and tarsi blackish. *Wings* pale yellowish grey, more yellowish in costal cell; stigma dark brown, more or less distinctly defined.

Length (entire) 16–18 millim.

Described from a type female from Kurseong, 5000 ft., Darjiling district, 7. ix. 09 (*Annandale*), and a female from Bhowali, 5700 ft., 15. vi. 10 (*A. D. Imms*).

Type in the Indian Museum.

243. **Tipula elegantula**, sp. nov. (Pl. V, fig. 17.)

♂. *Head*: vertex blackish grey, a narrow median darker line; remainder of head brownish yellow, a little darker about the proboscis and palpi. Antennal scape yellow, flagellum blackish, a single verticel of four hairs at the base of each joint. *Thorax* rather deep brownish yellow on the major part of the dorsum, with no obvious stripes; lighter posteriorly, and the colour at the sides fading away to a pale yellow. Scutellum and metanotum brownish yellow, shining, the former sometimes a little darker. *Abdomen* yellowish at base, changing to blackish before the middle. Genitalia large, conspicuous; a black bifid dorsal plate; 1st joint of claspers normal, 2nd joint ending in two pairs of appendages; the first club-shaped, with thick black hairs, the second two-jointed, with bristly yellow hairs and a row of stiff black bristly hairs along the inner side; the second pair of appendages unsymmetrically conical, black; a large **V**-shaped ventral plate with yellow hairs, and a pair of blackish finger-like inner appendages can be seen. *Legs*: femora dirty yellow or blackish, lighter at the base; coxæ pale yellow; extreme ends of femora narrowly pale; tibiæ and tarsi blackish. *Wings* very pale yellowish grey, costal cell yellowish, stigma a little browner; petiole of 2nd posterior cell short, about one-fifth the length of the cell. Halteres blackish.

Length 12 millim.

Described from two males from Mazbat, Mangaldai district, Assam, 11-15. x. 10 (*Kemp*).

Type in the Indian Museum.

Genus **PACHYRHINA**, *Macq.* (Pl. V, fig. 18.)

Pachyrhina, Macquart, Suit. à Buff., Dipt. i, p. 88 (1834); Schiner, Fauna Austr. ii, p. 503 (1864).

Genotype, *Tipula crocata*, L.; designated by Westwood (Intr. Class. Ins. ii).

Macquart's definition of this genus is not exactly a good one, as he lays no special stress on the only character in which it actually differs from *Tipula*, this character, moreover, being by no means absolutely constant. This is the sessile or non-petiolate nature of the 2nd posterior cell, due to the furcation of the anterior branch of the 4th longitudinal vein occurring at the distal end of the discal cell and not after quitting that cell, as in *Tipula*. In some species, however, the 2nd posterior cell actually is petiolate, the petiole being very short and the character varying to a somewhat considerable extent, comparatively speaking, in the same species, even in the two wings of the same individual.

Range. World-wide.

Macquart's remark about the antennæ being "filiform, nearly setaceous," is distinctly wrong, as the antennæ are as compact and the joints as easily seen as in *Tipula*.

The prevailing colour of bright yellow, marked with black, should be regarded as a character of secondary systematic value, yet it is remarkably uniform throughout the genus. The exceptions simply reverse the colours, that is to say, the ground-colour is mainly black, the markings yellow. In either case a little acquaintance easily differentiates a *Pachyrhina* from the more sombre hues of browns, yellows, or greys in *Tipula*.

Another apparently constant character, which does not seem to have been observed before, is the forking of the 4th longitudinal vein with its attendant results. The lower branch of the 4th longitudinal vein *forks never later than at* the base of the discal cell, normally a little before it, so that the posterior cross-vein being also placed exactly at the fork, *the whole posterior side of the discal cell abuts on the penultimate posterior cell.* The ultimate posterior cell is therefore not in contact with the discal cell when the forking occurs before that cell, and only in punctiform contact with it when the forking occurs exactly at the corner of the cell.* Normally, the furcation occurs just before the cell, sufficiently so to give the appearance of a short cross-vein on the hinder side of the discal cell, corresponding to the anterior cross-vein on the front side of it.† *Pachyrhina* has one marginal, two submarginal, and five posterior cells as in *Tipula.*

Life-history. The life-history of several of the European species is known. The larva lives under rotting leaves or in rotting wood; that of *P. pratensis*, L., in the roots of grass, according to Gmelin and Fabricius. Schiner records that clouds of the larvæ of this species were blown about in the air during the year 1852 in Westrogothia.

Table of Species.

1.	Antennæ sub-serrate on underside	2.
	Antennæ not sub-serrate	4.
2.	Pleuræ with a distinct shining black spot on the upper part of the sternopleura; scutellum black, metanotum bright lemon-yellow	*pleurinotata*, sp. n., ♂, [p. 343.
	Pleuræ wholly yellow, no black spot; scutellum and metanotum normally all yellow, the former sometimes with a black median stripe	3.
3.	Flagellar joints, except the 1st, wholly black	*serricornis*, sp. n., p. 341.
	Flagellar joints, except the 1st, yellow at the base	*puncticornis*, sp. n., [p. 343.

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* Obviously also, in the latter case, the 2nd basal cell is also in punctiform contact only with the discal cell.

† Compare a similar passage concerning the 4th vein in *Tipula* (p. 296). In both genera the posterior cross-vein is invariably placed at the angle in the 4th vein, the fork of the latter occurring at, or very close to, the same spot. No exception to this rule has come before me in any of the European, North American, or Oriental species examined.

4. Pleuræ with a shining black spot as in *P. pleurinotata* ♂ .... *pleurinotata*, sp. n., ♀. [p. 343.
Pleuræ without any black spot .... 5.
5. Wings distinctly submarmorate; the outer brown stripe on the lateral margin of the thorax rather conspicuously marked off from the yellow sides, below which colour lies a lateral brown pleural stripe; the 2nd posterior cell subpetiolate; obliterative streak present .... *demarcata*, sp. n.,* [p. 344.
Wings never marmorate; the side colours (if any) never so sharply defined; the 2nd posterior cell practically never petiolate; the obliterative streak absent .... 6.
6. Thorax wholly bright orange-yellow, the usual three dorsal stripes very faintly darker .... *concolorithorax*, sp. n.,† [p. 346.
Thorax always with the usual three dorsal black or dark brown stripes very distinct. 7.
7. Outer thoracic stripes distinctly turned outwards and downwards at their tips; femora generally more or less blackish on apical half .... 8.
Outer thoracic stripe abruptly terminated, clear-cut, but not curved outwards or downwards; femora generally yellowish with a tolerably distinct apical narrow blackish band .... 9.
8. Frons unmarked, or with a small vertical dark streak.......................... *consimilis*, Brun., p. 346.
An inverted Y-shaped black mark on frons *gamma*, sp. n., p. 347.
9. Bright lemon-yellow species (at least the thorax) † .... *javensis*, Dol., p. 348.
Brownish yellow or ferruginous species †.. 10.
10. Thoracic stripes clearly defined at their anterior ends .... *dorsopunctata*, Brun., [p. 350.
Thoracic stripes fading away gradually at their anterior ends .... *bombayensis*, Macq., [p. 351.

244. Pachyrhina serricornis, sp. nov.

♂. *Head*: ground-colour varying from bright lemon-yellow to rather deep orange-yellow; vertex and back of head often with a brown or blackish streak; frons somewhat prominent; whole upper part of head with very short black hairs; eyes black. Proboscis yellowish or orange-yellow, often with a dark brown or

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* A little uncertainty attaches to the presence of this species here, as the submarmorate wings and the obliterative streak are much more characteristic of *Tipula*. As, however, the 2nd posterior cell is sessile (petiolate in one specimen only), it should fall technically into *Pachyrhina*. It is the only species about the generic position of which there is any doubt.

† This is not a very good distinction, but no other seems practicable. In the case of doubtful or intermediate specimens, both sections must be searched.

blackish streak (sometimes double) on the upperside; tip of proboscis sometimes, and labella always, dark brown; palpi brown, brownish yellow, or yellowish, with black marks. Antennæ with scape bright deep yellow, 1st joint long, cylindrical, 2nd very short; 1st flagellar joint long, cylindrical, sometimes a little compressed just before the tip, generally more or less yellowish, sometimes wholly so; remainder of flagellar joints black, minutely pubescent, the upper surface smooth and the joints rather closely united there; on the lower side they are cut away at the base, the centre, and the tip of each joint, giving the complete joint the appearance of half a dumb-bell; this character being less conspicuous towards the tip of the antennæ; the last joint cylindrical, comparatively long. Two distinct diverging long hairs on upperside of each joint near the base, those on the underside being very short, inconspicuous or absent. *Thorax* bright chrome-yellow, lemon-yellow, or orange-yellow; dorsum with three clear-cut, shining black or blackish brown, moderately wide stripes, the middle one always attaining the anterior margin, where it is often continued on each side downwards as a very fine line behind the collare; the outer stripes shorter, about equal in width to the median, and curving outwards and downwards at the tips; behind the suture a pair of stripes similar in shape, size, and colour, also curving outwards and downwards at their tips, immediately above the roots of the wings. Scutellum varying in colour, generally pale livid yellowish brown, sometimes yellowish with a brownish centre, occasionally wholly bright lemon-yellow; mesonotum normally brownish yellow, varying in tint to a considerable extent, generally with a brownish median stripe; sides of thorax concolorous with dorsum, or a little lighter, unmarked. *Abdomen* yellowish or brownish yellow, with a dorsal black stripe composed of elongated spots, one on each segment, each more or less widened on the posterior margin; the dorsum of the apical segments mainly blackish; a blackish stripe along the sides of the abdomen, very variable in intensity and continuity; belly more or less yellowish. The whole abdomen with short golden yellow hairs. Genitalia fairly large, consisting of a thick oblong dorsal plate; the large subconical basal joint of the claspers ending above in an elongate piece narrowed at the tip, and forming below a large sub-globular portion to which two narrow elongate palp-like appendages are attached, one of these terminating in a dark horny long point; all the organs yellowish brown, and shortly but distinctly pubescent. *Legs* yellow, sometimes paler on basal half of femora, tips of femora and tarsi narrowly black, tarsi blackish. *Wings* pale grey; veins black, distinct; stigma very pale yellowish, sometimes blackish. Upper branch of 4th longitudinal vein on quitting discal cell, with the veinlets well separated, or issuing simultaneously. Halteres yellowish.

Length 8–11 millim.

Described from several males from Darjiling, 6. viii. 09 (*Paiva*); Kurseong, 4. ix. 09 (*type*), 5. vii. 08, 22–25. vi. 10 (*Annandale*);

Gangtok, Sikkim, 6150 ft., 10. ix. 09; Siliguri, N. Bengal, 18–20. vii. 07; all in the Indian Museum. In the Pusa collection are two males from Pusa taken 29. vii. 07 and 8. ix. 08. The species also occurs in Japan.

Type ♂ in the Indian Museum.

The two males in the Pusa collection have the median dorsal stripe brownish and indistinct (semi-transparent) in front, although equally well-defined and shining as in the typical form.

Some specimens taken by me at Yokohama, 20–26. vi. 06, have the scutellum all black, the black line on the mesonotum much wider and darker, and a distinct small oblong black spot on each side of the collare nearly in front of the median thoracic stripe. There can be little doubt they belong to the present species.

245. **Pachyrhina puncticornis**, sp. nov.

This form is ranked as a separate species, but may possibly be only a variety of *P. serricornis*, with which it agrees in most of its characters. As only one specimen is present, exact judgment is difficult.

♂. *Head*: the antennæ are as in *P. serricornis*, but the base only of each flagellar joint after the 1st is pale yellow, the 1st flagellar joint being yellowish on the basal half. *Thorax*: the median dorsal thoracic stripe is rather bright brown throughout its entire length, the side stripes are very dark shining brown, not curved outwards and downwards at the tip, nor carried forward as two fine lines each; the short post-sutural stripes are turned downwards towards the base of the wings, where they become much darker, but show no trace of being continued along the side of the thorax towards the shoulder. Scutellum apparently pale brownish yellow (damaged by the pin); metanotum and base of abdomen, also the posterior part of the thorax, bright light yellow. *Abdomen* mainly yellowish, the middle segments and the dorsum of some of the succeeding ones blackish. Genitalia apparently as in *P. serricornis*, perhaps comparatively a little smaller, but as they are considerably withdrawn their exact construction is not easily visible; they are rather bright brownish yellow in colour and considerably pubescent; the dorsal plate, if present, must be very small.

Length 10 millim.

Described from a single specimen from Siliguri, at the base of the Darjiling Himalayas, 30. vi. 08.

Type in the Indian Museum.

246. **Pachyrhina pleurinotata**, sp. nov.

This species is closely allied to *P. serricornis*, but is certainly distinct. The points of difference are as follows:—

♂ ♀: *Head*: proboscis with a small black streak on the upperside

at the tip, the labella and the palpi brown, the 1st joint pale brown; the back of the head with a triangular black mark; the antennæ in the male show no difference, but in the female the emargination on the underside of the joints is wholly absent, each joint being simply rather narrower at its tip than at its base. *Thorax* with the median dorsal stripe continued very distinctly on each side in front, the colour extending pronouncedly over the collare for some little distance; the two outer dorsal stripes terminating somewhat suddenly, but their edges continued as two very fine lines to the side margin; the post-sutural black shining stripes larger, almost filling the upper surface, and, besides turning down to the root of the wings as in *P. serricornis*, continued forward along the edges of the suture itself, passing over to the side of the mesothorax, and almost or quite reaching the shoulders. Scutellum wholly shining black; the metanotum bright lemon-yellow, unmarked; the sides of the thorax bright lemon-yellow, as in fact is the dorsum also, and there is a large black spot in each sex on the upper part of the sternopleura. *Abdomen* with the base black, whilst each segment has a broad black apical band, wider in the female than in the male, the last segment or two being black in both sexes. Genital organs of the male light brownish yellow, apparently formed as in *P. serricornis*; in the female the ovipositor is normal, long, shining, straight, light brownish yellow. *Wings*: the discal cell somewhat smaller; the veinlets of the upper branch of the 1st longitudinal vein emerging simultaneously; the stigma dark brown.

Length, ♂ 11 millim.; ♀ 14 millim. to tip of ovipositor.

Described from a single specimen of each sex from Namoya, Ceylon, ix. 1909 (*E. E. Green*).

Types in the Indian Museum.

247. **Pachyrhina demarcata**, sp. nov.

♂ ♀. *Head* rather deep yellow, with a median brown stripe on vertex extending from a little above the antennæ to the neck. Proboscis yellow above, brown below, labella brown; palpi yellowish to brown, often a little pale at juncture of joints. Antennæ with scape yellow; flagellum black. *Thorax*: male with ground-colour rather bright yellow; dorsum occupied by three rich brown stripes; the median one distinctly continued over the collare and neck till it joins the stripe on the vertex of the head; this stripe broadens a little before it reaches the anterior margin, narrowing as it reaches the suture, beyond which it is continued, rather narrower and unbroken, to the posterior margin of the yellow scutellum; the outer stripes join the median stripe anteriorly, and posteriorly they are united unbroken to the post-sutural stripes, which in their turn are continued to the hind margin of the thorax, thence, in a paler shade over the pleuræ on each side of the scutellum, continuing again over the metanotum, leaving

on this latter only a narrow pale yellow median space. The general pattern therefore of the dorsal surface is that of an elongated brown diamond extending from the neck to the end of the metanotum, enclosing an elongate central clear yellow space, down the middle of which runs the narrowed continuation of the median thoracic stripe; the outer edge of this diamond is clear cut and strongly demarcated from the bright yellow sides of the thorax. In the female the brown colour is not so deep on the scutellum and metanotum, and there is a broad rich brown lateral band on the lower part of the sides of the thorax, reaching from the neck to the metanotum. *Abdomen* of male yellow at base, the rest blackish, the basal yellow part with a blackish dorsal stripe and a thin lateral black line. In female, practically all blackish, except the 1st segment which is yellowish. Genitalia consisting of a small square black dorsal plate, moderately small dark side plates, the rest of the organs being bright yellow; the 2nd joint of the claspers very elongated, narrow, finger-like; apparently some inner organs also. Ovipositor normal, reddish yellow. *Legs* yellow; tips of femora rather broadly black or dark brown, the extreme tips (knees) pale; tibiæ and tarsi brown. In the female the apical half of the femora is more or less blackish. *Wings* rather dark grey; costal and subcostal cells distinctly yellow or yellowish; stigma oval, dark brown, conspicuous, with a small clear space on each side of it. There are also small, ill-defined though distinct, clear spaces beyond the middle of the discal cell (adjoining the 5th longitudinal vein), in the 2nd posterior cell, at the base of the discal cell and in front of the tip of the 7th longitudinal vein; a faint trace of suffusion apparent about the central cross-veins and over the 5th longitudinal vein. Halteres yellow. The obliterative streak peculiar to *Tipula* is present. The 2nd posterior cell sometimes shortly petiolate.

Length, ♂ 10 millim., ♀ 12 millim.

Described from one male and four females from Darjiling, 5–9. viii. 09 (*Paiva*).

Types ♂ and ♀ in the Indian Museum.

A very marked species, owing to the submarmorate wings, the only one in the genus known to me with this character. The presence, in conjunction with this, of the obliterative streak so peculiar to *Tipula*, makes it uncertain whether the species would not be better placed in that genus; but in more than one of the specimens the prongs of the anterior branch of the 4th longitudinal vein issue quite separately, and in only one is there a distinct petiole to the 2nd posterior cell, and even in this case a short one. It may, perhaps, temporarily be regarded as intermediate between the two genera, the only uncertain Eastern species in this respect that has come before me.

248. Pachyrhina concolorithorax, sp. nov.

♂ ♀. *Head* deep orange-yellow; antennal scape bright yellow, flagellum wholly black; proboscis orange-yellow, labella and palpi dark brown. *Thorax* bright orange-yellow, with faint traces of the usual three dorsal stripes and post-sutural spots, barely darker than the ground-colour. Slightly lemon-yellowish at sides below wings; scutellum and metanotum bright orange-yellow, unmarked. *Abdomen* bright orange-yellow; a black mark on 1st segment; the 2nd orange-yellow, black on posterior border; the remaining segments dull light yellow, with posterior borders rather broadly black, and with irregular black marks on the yellow parts; last segment wholly black. *Belly* mainly yellowish. Ovipositor shining brownish yellow. *Legs*: coxæ orange-yellow, femora light brownish yellow, tibiæ and tarsi dark brown. *Wings* nearly clear; stigma dark brown, well marked; discal cell oblong, nearly twice as long as broad, the two prongs of the upper branch of 4th longitudinal vein issuing separately but close together. Halteres orange, clubs blackish.

Length 12 millim., without ovipositor.

Described from a single male from the Khasi Hills, 1000–3000 ft., iii. 07, and a female from Sylhet, 18. i. 04 (*Lt.-Col. Hall*).

Types, ♂ in the Pusa collection, ♀ in the Indian Museum.

The uniformly orange thorax at once separates this species from all other Oriental ones.

249. Pachyrhina consimilis, *Brun.*

Pachyrhina consimilis, Brunetti, Rec. Ind. Mus. vi, p. 268 (1911).

♂ ♀. *Head* deep chrome-yellow; proboscis generally a little lighter, with a wide dark brown stripe on the upperside and dark brown labella; palpi also dark brown. Back of head at junction with thorax with a dark brown triangular mark. Antennal scape deep yellow, flagellum black, the joints distinctly but only slightly thickened at the base, verticillate hairs short; sometimes in the female the antenna is dark brown, the second joint of the scape being also tinged with brown. *Thorax* deep chrome-yellow; the three dorsal stripes deep black, shining, very clear cut; the median one, which attains the anterior margin, more or less extended downwards along the edge behind the prothorax, on which there is often a brown spot or streak on each side in this vicinity; the outer dorsal stripes turning sharply down over the sides at their tips, their limits sharply defined; the post-sutural elongate spots equally deep shining black and clearly cut, reaching from above the root of the wing to the scutellum. Scutellum light livid brown, sometimes yellowish, with or without a brownish or blackish mark in the centre; metanotum bright chrome-yellow, with a more or less distinct narrow or moderately wide brownish

longitudinal stripe; sides of thorax rather lighter yellow; sternopleuræ with a tawny brown, semi-transparent spot on the upper and lower part, leaving the middle concolorous. *Abdomen* normally bright or deep yellow, with, in the male, a longitudinal median black stripe of moderate width, composed of a row of elongate spots more or less united to one another, the black colour towards the tip spreading more or less over the whole dorsal surface; a narrow lateral stripe similarly formed. In the female, the abdomen is wrinkled and bears a large, more or less square, blackish spot on each segment, generally of sufficient size to form an apparently continuous dorsal stripe, but the posterior margin itself of each segment is yellow and well defined; there are also numerous irregularly placed small black spots between the dorsal stripe and the rather broader (than in the male) lateral stripe on each side. Belly similar to dorsal surface. Genitalia of male very much as in *P. serricornis*, but a distinct brown side plate is present, and a small yellow V-shaped ventral plate, protecting a somewhat conspicuous keel-like protuberance immediately above it, joined to the large swollen base of the claspers. *Legs* variable, normally yellow, the femora becoming brownish on the apical half, sometimes quite blackish on that portion; but often the femora are mainly yellowish, with an indistinct brownish or blackish ring of varying width at the tip; the tibiæ vary from yellowish to brownish; the tarsi generally brownish yellow or brown. *Wings* pale grey; the forks of the upper branch of the fourth longitudinal vein vary in their emergence from the discal cell, sometimes being distinctly separated, sometimes issuing simultaneously, and sometimes forming a short petiole; stigma moderately large, varying from pale yellow to brown; subcostal cell varying from yellowish to rather dark brown. Halteres yellow.

Length 9–14 millim.

Described from a lengthy series in the Indian Museum from Darjiling, 23–28. v. 10 (*Brunetti*), 5–10. viii. 09 (*Paiva*), 1. x. 08 (*Brunetti*); Kurseong, 19–24. vi. 10, 5. vii. 08, 5–8. ix. 09, and Bhim Tal, 17–19. ix. 06 (*Annandale*); Mussoori, 22. v. 05 (*Brunetti*), and Gangtok, Sikkim, 22. v. 05. In the Vienna Museum is a female from Sikkim.

Type, ♂ and ♀ in the Indian Museum.

Apparently the commonest species to be found in the hilly parts of North India, but no specimen has been received from the plains or even from a hilly locality apart from the Himalayas.

250. **Pachyrhina gamma**, sp. nov.

♀. *Head*: vertex nearly one-third the width of the head, orange-yellow, with a dark median narrow line; frons yellow, with an inverted black Y-shaped mark reaching from between the bases of the antennæ to the proboscis; the latter yellowish

marked with dark brown; palpi dark brown; antennal scape yellow, flagellum brown. *Thorax* lemon-yellow, with the three usual stripes very distinct, black, shining; the outer ones turned downwards at the anterior ends; prothorax blackish, a black stripe on each side extending to the shining black fore coxæ. Scutellum livid yellow; metanotum and sides of thorax pale lemon-yellow. *Abdomen* yellowish, crinkled, with short pale hairs; a wide dorsal black stripe composed of a large spot filling, or nearly filling, the dorsum of each segment, the spots contiguous or subcontiguous; an uninterrupted black stripe along the lateral margins of each segment. Belly similar, almost wholly black. *Legs*: fore coxæ shining black, posterior coxæ pale yellow; femora brown, basal half a little lighter. *Wings* with the 2nd posterior cell subpetiolate, about one and a half times as long as the discal cell.

Length 13 millim.

Described from a unique female from the Mangaldai district, on the Assam-Bhutan frontier, 30–31. xii. 10 (*Kemp*).

Type in the Indian Museum.

251. **Pachyrhina javensis**, *Dol.*

Tipula javensis, Doleschall (nec *T. javana*, Wied.), Nat. Tijd. Ned. Ind. x, p. 406, pl. iii, fig. 2 (1856).
? *Pachyrhina fasciata*, Macquart, Suit. à Buff., Dipt. i, p. 90 (1834).
Pachyrhina doleschalli, Osten Sacken, Ann. Mus. Genova, xvi, p. 399 (1881).

"Body lemon-yellow. Thorax with four black lateral rounded spots and an oval median one. Segments of the abdomen broadly black-marked, the sixth and the eighth black; ovipositor reddish. Antennæ blackish; legs yellowish, blackish at the articulations. Wings clear, stigmatic cell black.

"Length 7 lines [=14 millimetres]. Habitat: Java, in woods (Djokjakarta)." (*Osten Sacken.*)

Type ♂ in the Vienna Museum.

The species was renamed by Osten Sacken, on the ground that Wiedemann in 1821 described a species under the name of "*Tipula*" *javana* (Dipt. Exot. i, p. 27), which is a *Pachyrhina*; but I venture to restore the name *javensis*, as it is not a homonym of *javana*.

Redescription.

♀. *Head* varies from bright lemon-yellow to rather deep orange, with short sparse light pubescence; frons very convex and prominent. Proboscis short, broad, with or without a broad shining black stripe; labella large, shining brown, pubescent; palpi with 2nd and 3rd joints equally long, but the 1st a little shorter, and the 4th as long as the first three together, thinner, all pale yellow.

Antennæ bright yellow or orange-yellow; flagellum wholly blackish, except 1st joint, which is sometimes yellowish, bases of all the flagellar joints after the 1st very narrowly blacker. *Thorax* deep lemon- or chrome-yellow; the three usual dorsal stripes deep black, shining, clear-cut; the median one reaching the anterior margin or not, very narrowly extended (sometimes) on each side for a short distance; on each side of the collare, adjacent to the end of the median stripe, is a brown or black mark, which is repeated on the adjoining part of the mesothorax; the two outer thoracic stripes quite straight, with clear-cut rounded tips, without any sign of curving outwards or downwards; post-sutural stripes short, wide, equally shining black, contiguous in front to those in front of the suture, and carried forward a little along the suture, joining a brownish spot placed immediately above the wing-root; posteriorly they reach the scutellum, which may be wholly dull yellow, or wholly shining black. The metanotum may be lemon-yellow, the lower part bearing an orange tint, or it may be either yellow or orange, with a wide black band on the lower part; the pleuræ adjacent to the metanotum bear a black stripe contiguous to it; sides of thorax concolorous with dorsum; sternopleura with median third concolorous, the upper and lower parts tinged with orange. *Abdomen* bright orange-yellow; presumably the normal banding consists of a moderately narrow black posterior border to each segment, the first segment being either yellow at the base or more or less black-marked; the abdominal bands seem to be weakest on the 4th and 5th segments; the 6th segment is nearly or wholly black, the remainder to the tip yellow. Ovipositor brownish yellow, shining, rather long. *Legs*: coxæ, femora, and tibiæ bright yellow or orange-yellow; fore femora with a dark brown broad band (ill-defined at the edges) in the middle, occupying about half the length, sometimes indistinct; tips of all femora and tibiæ very narrowly blackish; tarsi blackish. *Wings* nearly clear; subcostal cell dark brown, ending in a large oval dark brown stigma; petiole of 2nd posterior cell comparatively long or absent. Halteres blackish, tips dull yellow.

Length 17–19 millim.

Redescribed from three females in the Indian Museum, taken at the base of the hills in the Naini Tal district, two at Bindukhera, 3. iv. 10, and one at Gangapur Pattia, 4. iv. 10. The species also occurs in Java, Sumatra, and Ceylon.

I think there can be no doubt that the three females in the Indian Museum are this species and that it is very variable. Osten Sacken surmised as much, noting the variability of the abdominal markings and the spots on the pleuræ; whilst various remarks in the three different descriptions of this species (Doleschall's, Macquart's, and Osten Sacken's) support this view. The three examples before me are distinctly *lemon*-yellow, especially on the thorax, thus agreeing with Doleschall's "citrino-flavo."

Macquart's remark that the metathorax is all yellow is probably an error for metanotum, which in one of the three specimens is very conspicuously uniform lemon-yellow, in another bright lemon-yellow with an orange hind border, and in the third orange with a blackish lower margin. The scutellum also varies, being in two specimens shining black, in the third shining brownish yellow. Again the abdominal marks are very variable. The first example has the basal segment black, a broad black band on hind margins of the 2nd and 3rd segments, a narrow one on the 4th and 5th, the 6th being mainly blackish. In the second specimen the only black is on the tips of the 2nd and 3rd segments, the whole of the 6th and the base of the 7th. In the third specimen the marks are similar, but narrower, and rather less intense. The fore femora have a broad blackish central band which is quite distinct in one specimen, much less so in the second, the third having these legs missing. This character has not been noted before. In one specimen the pleuræ are slightly marked with black, in another they are entirely lemon-yellow, except for a rather large pale orange spot below the wing-root.

Macquart notes that the second posterior cell is nearly petiolate. In two of the three examples before me it is quite distinctly so, as much as in many species of *Tipula*; in the third it is very shortly, but still practically so, and slightly more in one wing than the other. All these points prove the variability of the species in many particulars, and the comparatively small size of the discal cell, which is emphasized in the present specimens, is also a strong specific character.

252. **Pachyrhina dorsopunctata**, *Brun.*

Pachyrhina dorsopunctata, Brunetti, Rec. Ind. Mus. vi, p. 267 (1911).

♂ ♀. *Head* deep chrome-yellow; proboscis, labella, and palpi more or less brownish; antennal scape deep yellow, flagellum wholly black, or 1st joint yellow. *Thorax*: dorsum between the stripes orange-yellow, the colour fading at the edges of the dorsum to paler yellow; sometimes the whole dorsum pale yellow; thoracic stripes dark blackish brown, the median one sometimes a little paler towards the anterior margin. The dark marks on the prothorax and behind it, as in the other species, sometimes appearing as a definite continuation of the median thoracic stripe. Post-sutural stripes more of a flattened triangle in shape, not joined to the outer stripes in front of them. Scutellum black or dark brown, shining; metanotum yellowish on upper half, with or without a narrow dark median line, black on the lower half; sides concolorous, or a little paler. upper and lower parts of sternopleuræ a little more orange. *Abdomen* yellow or orange-yellow, with a row of dorsal elongate triangular black spots in the male which have a tendency to spread out on the hind margin, actually doing

so on the last two segments. In the female one specimen has the marks as in the male but they are rather more extensive; the other has a black band on the hind margin of each segment. Traces of a black narrow side line in both sexes; belly yellowish. *Legs* wholly yellow; tips of femora and tibiæ narrowly black; tarsi blackish. *Wings* very pale grey; subcostal cell dark brown, prongs of fork of upper branch of 4th longitudinal vein issuing quite separately from discal cell. Halteres yellowish.

Length, ♂ 12–14 millim.; ♀ 15–18 millim.

Described from several males and females in the Indian Museum from Katihar, 30.xi.09 (*type* ♂), Bhogaon, 20.xii.09, both Purneah district (*Paiva*); Maddathorai, Travancore State, 17.xi.08 (*type* ♀) (*Annandale*); Bindukhera, Naini Tal district, base of Western Himalayas, 3.iv.10, taken in company with *P. javensis*, Dol.; Madhupur, Bengal, 13.x.09 (*Paiva*); Mangaldai district, Assam–Bhutan Frontier, 30.xii.10 (*Kemp*); Pusa, 31.iii. and 4.iv.11 (*Gravely*). One female from Ceylon is in the Vienna Museum.

Type ♂ and ♀ in the Indian Museum.

Its bright colour, the yellow and black distinctly demarcated, exactly resembles *P. javensis*, and it may be but a variety of that species; yet the abdominal marks seem so pronouncedly different that I have ventured to regard it tentatively as distinct. On each segment is a triangular rather elongate (especially on the long 2nd segment) shining black spot which shows no tendency to form a band on the hind margin. The base of the ovipositor is distinctly blackish. The front femora show no sign of the broad blackish band present in *P. javensis*. The two prongs of the upper branch of the 4th longitudinal vein quit the discal cell well separated.

Two males in the Pusa collection bred from larvæ found under the earth in rice-fields at Pusa may be this species, though they are smaller and more slender (12 millim.). The median dorsal thoracic stripe is entire and clearly cut to its extremity on the anterior margin. They are dated 16.ii. and 26.ii.1910.

253 **Pachyrhina bombayensis**, *Macq.*

Pachyrhina bombayensis, Macquart, Dipt. Exot. Supp. v, p. 35, pl. i, fig. 1 (1854).

"♂. Length 12 mm. Ferruginous. Palpi a little brownish at the tips. Antennæ brown, the three first joints ferruginous. Thorax with three black stripes, not reaching the anterior margin. Abdomen with a black triangular spot on the hind border of each segment; genitalia small. Femora a little blackish at the tip, anterior tibiæ brownish, tarsi brownish. Wings iridescent, a little yellowish; stigmatic region ('cellule') brownish; discoidal cell small.

"From Asia; Bombay. In Mr. Bigot's collection." (*Macquart.*)

Redescription.

♂ ♀. *Head* varying from yellow to reddish brown; proboscis above and at tip darker brownish, palpi yellowish. Antennal scape yellow, flagellum black, the joints slightly but distinctly enlarged at base where they bear the usual verticillate hairs. *Thorax* varying from yellow to orange and reddish brown; the three usual dorsal stripes, the middle one nearly always very indistinct on the anterior part, this indistinctness sometimes extending back to the middle of the stripe; the outer ones often, but not always, indistinct at their tips, never curved outwards or downwards; post-sutural stripes sometimes contiguous to those in front, the narrow black streak in front of the wing and below the edge of the dorsum rather more conspicuous than usual. Scutellum mainly blackish; metanotum with upper half yellowish, sometimes with a thin median dark line, lower half blackish. *Abdomen* normally brownish yellow, but varying considerably in shade towards entirely yellow or entirely reddish brown; the black markings very variable, forming sometimes an elongate black spot on each segment, more or less widened on the hind margin, the dorsum of the apical segment generally wholly black or nearly so; sometimes occupying nearly all the dorsum on all the segments; sometimes barely widened posteriorly, especially in the male and on the basal segments. In the female, the black colour is more extensive, often filling the entire dorsal surface. Belly mainly yellowish but blackish towards the tip. Genitalia conspicuous, brownish yellow, consisting of an oblong rather small dorsal plate, a pair of claspers, of which the basal joint is normally constructed, with a large flattened, almost leaf-shaped, pointed second joint, which bears on the inner side a narrow black finger-like appendage; some smaller intermediate organs are apparent. Ovipositor brownish yellow, shining, bare, normal. *Legs* brownish yellow, extreme tips of femora and tibiæ very narrowly black, apical half of tarsi blackish. *Wings* pale grey, subcostal cell brown; stigma brownish, varying in intensity; prongs of upper branch of 4th longitudinal vein issuing generally widely separated, occasionally simultaneously or nearly so, but 2nd posterior cell never petiolate. Halteres dark yellowish brown.

Length 13–21 millim.

Redescribed from a good series in the Pusa collection, all from Pusa (except one) bearing dates of every month except May, June, and December, the species apparently occurring there nearly all the year. One specimen is from Chapra, Bengal, undated. One specimen in the Indian Museum from Katihar, Purneah district, Bengal, 7–31. viii. 10 (*Paiva*).

Type in the British Museum.

The principal feature of this species is its reddish brown colour, and the obliteration of the anterior end of the median thoracic stripe.

Section *DOLICHOPEZINI.*

As previously stated, the excessively delicate and long legs afford the principal character by which members of this section may be known. They have a habit of dancing up and down in the air in small swarms after the nature of Ephemeridæ, a habit equally affected by various genera of Tipulidæ—*Dicranomyia*, *Trichocera*, and in fact many others.*

Apart from the length of leg common to all, the genera in this section are mainly contradictory, so to speak. Taking the four Oriental genera, *Dolichopeza* and *Scamboneura* possess thirteen-jointed antennæ, *Megistocera* and *Tanypremna* less than thirteen. The two former genera have complex genitalia in the male, the two latter more simple ones. *Dolichopeza* has no nasus, but this is distinct in *Scamboneura* and *Megistocera*. *Tanypremna* has no neck, yet *Scamboneura* and others have short ones. The anterior branch of the 2nd longitudinal vein is present in *Megistocera* and *Tanypremna*, absent in the other two; the anterior branch of the 4th vein is twice forked in *Dolichopeza*, only once forked in the other three genera; the discal cell is present in *Megistocera* and *Tanypremna*, absent in *Dolichopeza* and *Scamboneura*. In *Megistocera* the 5th posterior cell is not in contact with the discal cell, as it is in *Tanypremna*.

The following is the only genus which occurs within our limits:—

Genus **DOLICHOPEZA**, *Curt.*

Dolichopeza, Curtis, Brit. Entom. p. 62 (1825).
Apeilesis, Macquart, Dipt. Exot. Supp. i, p. 8 (1846).
Leptina, Meigen, Syst. Besch. vi, pl. lxv, fig. 10 (1830).

Genotype, *D. sylvicola*, Curt.; by original designation.

Head transverse; frons arched; eyes rounded. Proboscis rather prominent but short, the upperside hairy; no nasus; the palpi four-jointed, long, cylindrical, whip-like. Antennæ thirteen-jointed, the ultimate one very small;† structure of scape and flagellum normal. *Thorax* as in *Tipula*, only rather more delicate. *Abdomen* much as in *Tipula* but more slender. The genitalia slightly swollen, bearing some resemblance to those of *Pachyrhina*.‡

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* It is curious that most insects with exceedingly long and delicate legs, wings, antennæ, or caudal setæ possess this habit of aërial dancing, the length of limbs presumably acting as a means of balance.

† The antennæ were originally described as possessing twelve joints only; Zetterstedt, Meigen, Curtis, and Walker uniting in this error. Schiner suggested that thirteen were present, this number being subsequently confirmed by Osten Sacken's examination of living specimens of both sexes.

‡ Osten Sacken observed the union of the sexes in a European species, probably *D. sylvicola*, Mg. "The female was hanging down from some support to which it held on by its front legs; it bore the whole weight of the male, who was fastened to it merely by the forceps, hanging head downwards, with his legs stretched out. I have seen *Bittacomorpha* copulate in the same manner."

Legs excessively long and slender, especially the tarsi. Apical spurs of tibiæ very minute, hardly visible amongst the hairs on the tip, more distinct on the hind legs. *Wings* with no discal cell; one marginal, one submarginal, and five posterior cells. Auxiliary vein ending some distance beyond the middle of the wing, turning at its tip into the 1st longitudinal vein, which, ending a little beyond the auxiliary, itself turns into the 2nd vein before the middle of that vein, which latter is very short, strongly bisinuate, originating at two-thirds the length of the wing; the discal cross-vein short; no anterior branch to the 2nd vein; the 3rd vein almost of the same length and shape as the second; the anterior cross-vein very short; the 4th vein forking just *beyond* the posterior cross-vein, the anterior branch forking just before its middle, the upper prong again forking about its middle, the veinlets nearly parallel, thus making the 2nd posterior cell petiolate; the lower prong simple, strongly bisinuate; the posterior branch of the 4th vein gently bisinuate, the posterior cross-vein very oblique; the 5th, 6th, and 7th veins nearly straight.* The "obliterative streak" is absent.

254. **Dolichopeza orientalis**, sp. nov. (Pl. V, fig. 19.)

♂ ♀. *Head*: vertex and frons rather bright light brownish yellow (darker yellow in female); frons one-fourth to one-third the width of the head; back and underside of head pale yellowish, with short black hairs. Eyes wide apart below, with a small black spot at their inner angles. Proboscis short, thick, yellowish; palpi brown or blackish, the last joint narrowed at its base, clubbed towards its tip. Antennal scape pale or orange yellowish, 2nd joint short; flagellum of thirteen very elongate, brownish yellow, cylindrical joints, the 1st one and a half times as long as the 2nd, the rest gradually diminishing in length, the last very short, all with close microscopic pubescence below and some longer scattered hairs on the upperside. *Thorax* wholly pale yellowish, except three short and not very distinct reddish brown narrow stripes on the dorsum, in the usual position, the outer ones sometimes barely visible; two brownish irregularly shaped spots behind the suture. Scutellum, metanotum, and sides of thorax concolorous. *Abdomen* variable, reddish or yellowish brown, with very few pale hairs; posterior margins of segments more or less black, the whole of the 7th and 8th segments black, sometimes the 4th, 5th, and 6th segments also. Genitalia large, globular, but mainly concealed, black; two pairs of slender, yellow, palp-like organs, the upper pair the longer and more slender, closely pubescent; there are three pairs of inner organs, one pair consisting of a slender basal

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* *Dolichopeza* is easily recognised by its wings; the absence of the discal cell, the simple 2nd vein, the twice forked anterior branch of the 4th and the bisinuate nature of many of the veins form a venation quite distinct from all else in the TIPULIDÆ.

piece, with a long terminal apparently chitinous filament; another pair short, round-tipped, pale yellow, pubescent; the third pair in the shape of flattened spoons, black, small, short, close to the underside of the whole genitalia. Ovipositor in female normal, rather small, brownish yellow or reddish brown. *Legs* pale yellowish, femora brownish yellow at the base, becoming blackish at the slightly enlarged tips; tibiæ brownish yellow, tips whitish (in the hind pair for a considerable distance); tarsi wholly snow-white. *Wings* pale yellowish grey in male, wholly colourless, glassy and iridescent in female, stigma large, dark brown, ending just beyond the marginal cross-vein. Venation normal; auxiliary vein ending at a little beyond one-third of the distance between the origin of the 2nd vein and the tip of the 1st vein; the 2nd vein beginning just beyond the middle of the wing, the præfurca being nearly half the length of the vein; the 3rd vein originating at right angles, in a direct line with the anterior cross-vein and equal to it in length; the 4th longitudinal vein with the anterior branch twice forked, thus making five posterior cells. Discal cell absent, coalescing with 4th posterior cell; the anterior cross-vein would have been over nearly the middle of the discal cell, and the posterior cross-vein much before the base of that cell, had it been present. In the female, when the wing is viewed at a low angle facing the light, the most magnificent brown, red and orange iridescence is visible. Venation normal. Halteres black, stems exceedingly slender, yellow.

Length 6 millim.

Described from a single male from Kurseong, 8. vii. 08, and two females from the same place, 4. ix. 09 and 22. vi. 10 (*Dr. Annandale*).

Type ♂ and ♀ in the Indian Museum.

255. Dolichopeza obscura, sp. nov.

♂ ♀. *Head* dirty brownish grey in male, more yellowish in female, in both sexes lighter on frons, which latter is about one-third the width of the head, uniformly wide or nearly so. The lighter colour extends more or less to the upperside of the proboscis. Scape of antennæ pale yellowish, flagellar joints distinctly longer in male than in female. *Thorax* and *abdomen* dirty obscure blackish brown, unmarked, the thorax a little lighter brown in the female. Genitalia of male brownish yellow, composed of a large V-shaped ventral plate, the claspers with large bulbous first joint, the second ending in a black horny tip. *Legs* black. *Wings* grey, stigma rather deep blackish.

Length 8 millim.

Described from a pair taken at Kurseong, 4700 ft., the male 14. iv. 11, the female 29. vi. 10 (*Dr. Annandale*).

Type ♂ and ♀ in the Indian Museum.

Dr. Annandale states that the species is common in jungle, being mostly found flying in small parties of four or five.

Subfamily LIMNOBIINÆ.

The principal characters of the LIMNOBIINÆ are: the ending of the auxiliary vein in the costa, instead of in the 1st longitudinal vein; the presence of a subcostal cross-vein between the auxiliary and 1st veins, which occurs in the great majority of the species; the presence of the marginal cross-vein in a considerable number of genera, a vein which is absent in TIPULINÆ, though it may be considered to be therein represented by what I term the costal cross-vein, in spite of the slightly different position it holds. This costal cross-vein never appears in the present subfamily, and Osten Sacken's rhomboidal cell is therefore always absent also.

Another great difference, which is practically constant, is the ending of the 1st longitudinal vein in the costa, instead of turning down into the 2nd vein as is practically always the case in the TIPULINÆ.* When (as is very often the case) the marginal cross-vein is placed near the tip of the 1st longitudinal, the effect is frequently produced of the latter turning down into the 2nd vein, with a cross-vein joining it near its tip to the costa. The student must avoid making this error, however apparent such a case may seem to be. In a few abnormal genera (*Antocha* and *Toxorhina*, for instance), the auxiliary and 1st longitudinal veins are united, in which case the united veins are recognized as the 1st longitudinal, and this itself in these genera becomes gradually merged in the costa, which in consequence is a little thickened at that spot for a short distance. The 2nd longitudinal vein is often forked, and one or other of its branches again forked, thus making the number of marginal and submarginal cells inconstant, and contingent on whether it is respectively the upper or lower branch that is forked.

A very constant and characteristic feature is the position at which the lower branch of the 4th longitudinal vein forks, which is at or beyond the distal end of the discal cell, and not at the basal or proximal end of this cell as in TIPULINÆ. This feature causes several other peculiarities, which are best studied in comparison with their relative differences in TIPULINÆ. The obliterative streak, so conspicuous in the genus *Tipula* itself, and present to a less extent in some of the other genera of TIPULINÆ, is invariably absent in LIMNOBIINÆ.

The antennæ in LIMNOBIINÆ are normally 14- or 16-jointed, but exceptions are by no means rare; such are the ANISOMERINI, with 6- and 10-jointed antennæ, and a few other abnormal genera with 13, 15, 17, and so on. The scape is usually much broader, especially the 2nd joint, than the basal flagellar joints. The nasus or nose, so conspicuous a character in most of the TIPULINÆ, is absent in the present subfamily. The palpi are not so long and whip-lash-like, although moderately elongate and generally incurved:

* *Cylindrotoma* forms the only Indian exception.

but they are reduced to two small joints in at least one genus, *Geranomyia*.

It may be observed here that the suggested substitution of the name *Limonia*, Mg., for *Limnobia*, with the consequent alteration of the subfamily and sectional names is wholly untenable. This and all the other generic names set up by Meigen in his paper published in 1800, were established without any species being indicated, and are therefore on that ground alone inadmissible. Moreover, such standard names as *Limnobia*,* sanctified by use by all authors for over a hundred years, have earned their right to remain unaltered as long as the science of natural history exists. Again, Meigen himself entirely ignored the existence of the French pamphlet in which these names appeared, when he published his authentic work in German some three years later; and seeing that endless confusion would arise from the adoption of these genera, they can have no just claim whatever to recognition.

Table of Sections of the Subfamily Limnobiinæ.

1. Only one submarginal cell	2.
Two submarginal cells (one only in some species of *Gonomyia*)	4.
2. Antennæ 16-jointed	3.
Antennæ 14-jointed.—One submarginal cell; four posterior cells; subcostal cross-vein near tip of auxiliary vein; discal cell open or closed; posterior cross-vein at base of discal cell or before it. Tibiæ without spurs. Proboscis long or moderately long	Limnobiini, p. 362.
3. The 1st longitudinal vein generally ending in the 2nd. Tibiæ with spurs	Cylindrotomini, [p. 358.
The 1st longitudinal vein ending in the costa; four posterior cells; discal cell open or closed. Tibiæ without spurs.—Proboscis variable, sometimes enormously produced *	Rhamphidiini, [p. 415.
4. Tibiæ without spurs.—Four posterior cells (five in *Cladura* and allies); wing often pubescent on the veins only or on the surface also; subcostal cross-vein generally some distance before the origin of the 2nd vein, but sometimes near the tip. Antennæ 16-jointed	Eriopterini, p. 436.
Tibiæ with spurs	5.
5. Subcostal cross-vein before the origin of the 2nd longitudinal vein (some distance before the tip of the auxiliary vein). Eyes pubescent.—Frons generally with a moderately distinct protuberance. Four or five posterior	

* The same argument applies to the other genera.

† The Rhamphidiini form the least well-defined section in this subfamily, more exceptions occurring in it than in any other. The submarginal cell is absent in *Toxorhina*; the marginal cross-vein absent in *Atarba*; the posterior cross-vein is near the middle of the wing in *Orimarga*.

cells; penultimate posterior cell nearly always pointed at the base. Antennæ of 17, 16, or 13 joints .... *Amalopini*, p. 507.

Subcostal cross-vein beyond the origin of the 2nd longitudinal vein. Eyes bare .... 6.

6. Antennæ of 16 joints.—Five posterior cells, sometimes only four; posterior cross-vein often near middle of discal cell; proboscis very short, generally transverse, terminal labella fleshy and thick .... *Limnophilini*, [p. 520.

Antennæ of 6 to 10 joints; often elongated or enormously prolonged.—Antennæ 6-jointed in male, 10-jointed in female; three, four, or five posterior cells; discal cell open or closed; subcostal cross-vein near tip of auxiliary vein, beyond the origin of the 2nd longitudinal vein .... *Anisomerini*, [p. 529.

Section *CYLINDROTOMINI.*

Eyes bare, separated above by a rather broad frons, not contiguous on the underside. Proboscis short. Palpi 4-jointed. Antennæ normally 16-jointed.* The male genitalia generally of peculiar structure, considerably differentiated in the various genera and species. Tibiæ with apical spurs, empodia distinct. Wings with one submarginal cell, four or five posterior cells, and a discal cell; the 1st longitudinal vein incurved at the tip towards the 2nd vein, meeting it, instead of ending in the costa.† The auxiliary vein ends abruptly, without turning into either the costa or the 1st longitudinal vein. The marginal cross-vein, as such, is absent, but there is present a supernumerary cross-vein joining the costa to nearly the tip of the 1st longitudinal vein.‡

This section is intermediate between the subfamilies Tipulinæ and Limnobiinæ, but is considerably more akin to the latter. Its affinities with the Limnobiinæ are as follows:—

(1) In the palpi, which, although elongate, have not the whiplash nature of these organs in the Tipulinæ.

(2) In the absence of the peculiar fold in the wings, which in most of the Tipulinæ runs more or less across the wing transversely, beginning in the region of the stigma, and which I have termed the obliterative streak.

(3) In the length of the *inner* marginal cell—that is to say, that portion of the marginal cell enclosed by the turned-down 1st longitudinal vein, which in most Tipulinæ is much shorter.§

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* Some European authors (Zetterstedt, Walker, etc.) speak of the antennæ as 17-jointed, which is incorrect; the error is due to the fact that in dried specimens the prolongation of the 16th joint looks like an additional one.

† There is at least one exception to this form of venation (*Phalacrocera replicata*, L., of Europe), and others may occur.

‡ This cross-vein I have proposed to call the costal cross-vein.

§ This is according to Osten Sacken; but I have not found it so myself, there being, judging from my own experience only, no difference between the two groups in this respect.

(4) In the number of the antennal joints—16, which is the usual number in the LIMNOBIINÆ, whereas in the TIPULINÆ the normal number is 18.

(5) In the number of posterior cells—four normally, but occasionally five. This, however, is not so much a resemblance to the LIMNOBIINÆ, where genera with five posterior cells are by no means rare, as a difference from the TIPULINÆ, in which the usual number of cells is five.

There appears to be no direct affinity to the TIPULINÆ, except the general appearance, which is much more like that of a small species of *Tipula* than of a Limnobiid. Another possible point of resemblance is that the CYLINDROTOMINI, though having only one submarginal cell, have spurs to the tips of the tibiæ, whereas all those genera of LIMNOBIINÆ that possess only one submarginal cell have no spurs to the tibiæ; but this, too, is rather a difference from the LIMNOBIINÆ than any actual affinity to the TIPULINÆ.

The abrupt ending of the auxiliary vein is in itself a character of an intermediate nature, as in the TIPULINÆ the vein nearly always turns downwards into the 2nd vein, whilst in the LIMNOBIINÆ it generally turns upwards into the costa.

"The CYLINDROTOMINA, with all the prevailing characters of the TIPULIDÆ BREVIPALPI, show important aberrations in the course of the veins in the vicinity of the stigma—aberrations which prove a leaning towards the TIPULIDÆ LONGIPALPI. The latent affinity to the latter is further proved by the presence of spurs on the tibiæ and by the general appearance." (Osten Sacken.)

The few genera making up this section are so closely interwoven that there is some difficulty in separating them, and from the point of view of some entomologists a separate genus might be established for nearly every species, owing to the range of variation shown in the antennæ, the venation, the genital organs of the male, and other characters.

At present, however, only the genus *Cylindrotoma* itself has been found in the East, with but a single species to represent it.

Genus **CYLINDROTOMA**, *Macq.*

Cylindrotoma, Macquart, Suites à Buff., Dipt. i. p. 107 (1834).

GENOTYPE, *Limnobia distinctissima*, Mg.; by designation of Westwood (Introd. Class. Ins. ii).

Head rather broad posteriorly. Eyes bare, separated by a broad frons. Proboscis very short. Palpi somewhat elongate, especially the last joint. Antennæ with the 1st scapal joint very short, the flagellum of elongate cylindrical joints, minutely pubescent, with short thin scattered verticels; in the female the antennæ rather shorter and less pubescent. *Thorax* robust, compact, no conspicuous neck. *Abdomen* moderately long and slender, clubbed

at the tip in the male. Genitalia complicated and peculiar in structure.* *Legs* slender, tibiæ with distinct spurs at the tips; fore coxæ short; empodia distinct. *Wings* with one submarginal cell, five (normally) posterior cells, † and the discal cell closed. The auxiliary vein ends abruptly neither in the costa nor in the 1st longitudinal vein, but sometimes it is indistinctly connected near its tip with the latter. The 1st longitudinal vein turns down at its tip into the 2nd; a more or less indistinct cross-vein connects it with the costa. The 2nd vein begins about the middle of the wing, the præfurca forming about half its length; the 1st longitudinal vein meets the 2nd soon after the origin of the 3rd vein, which commences just before the middle of the 2nd vein, forming with the 2nd vein a fork, the submarginal cell thus being triangular. Anterior cross-vein at origin of 3rd vein, uniting with the discal cell at one-third the length of the latter; discal cell closed, more or less oblong; anterior branch of 4th vein forked soon after quitting discal cell, the veinlets more or less parallel; ‡ posterior cross-vein just beyond discal cell; 7th vein comparatively short.

Range. The few species known are distributed through Europe, North America (including Alaska), and South America, in addition to India.

Life-history. The metamorphoses of a moderately common European species, *Cylindrotoma distinctissima*, Mg., have been observed by more than one biologist. The larva has the exceptional character of living on the undersides of the leaves of low-growing plants, like the caterpillar of a Lepidopterous insect. It is green, elongate, flattened, linear, only a little pointed at each end, with a longitudinal crest along its back, consisting of a row of fleshy processes pointing backwards; the lateral margin is broad, with many excisions, formed by fleshy points. The larva, before transforming, quits its food-plant and attaches itself to a stalk of grass, on which to undergo the pupa state. The pupa bears some resemblance to that of a Lepidopterous insect, the thorax bearing several horny processes.

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* Osten Sacken says:—"The long narrow linear horny lamella, which usually protrudes when the living insect opens its forceps, ends in three sharp points." Speaking of the ovipositor of the female, he continues:—"It is rather large, the upper valves are lamelliform towards the tip, and the lower ones are curved in such a manner as to leave a considerable empty space between them and the upper ones."

† If my new species is correctly placed here, the generic description must read, "four or five posterior cells."

‡ Schiner, in describing *Cylindrotoma distinctissima*, Mg., the commonest of the European species, infers that the forking of the anterior branch of the 4th vein is not always constant, so that specimens of this species may have four or five posterior cells accordingly. In Needham's figure of the wing of this species he shows the auxiliary vein very distinctly turning up into the costa, with an equally distinct subcostal cross-vein near its tip, uniting it to the 1st longitudinal vein near the tip of the latter. This is a mistaken interpretation.

The larva, according to Schiner, feeds on *Stellaria nemorum*, *Anemone nemorosa*, and *Allium ursinum*. It is also found on *Viola*. Zeller ('Isis,' 1842, p. 808) gives a good description of the larva; whilst Schellenburg, who figures it ('Genres des Mouches'), may also be consulted on the same subject, although this author mistook the larva for that of a *Pachyrhina*.

The larva of a European species of another genus (*Phalacrocera replicata*, L.) lives upon aquatic plants growing beneath the surface of the water. It is very hardy, as it has been known whilst in captivity to pass the winter in this state even though ice formed on the top of the water. In May it pupates and floats or descends below the surface at will by means of several pairs of hooks by which it traverses the stems of plants. De Geer ('Insectes,' vi, p. 351, pl. xx) may be consulted on the subject.

256. **Cylindrotoma quadricellula**, *Brun.* (Pl. VII, figs. 1, 2.)

Cylindrotoma quadricellula, Brunetti, Rec. Ind. Mus. vi, p. 268 (1911).

♂. *Head*, viewed from above, oval; blackish, bare above; frons short, much wider on vertex, where it is about one-fourth the width of the head. Face below antennæ a little lighter; palpi small, black. Scapal joints of antennæ short, yellowish; the fourteen joints of the flagellum dark brown, very elongate, somewhat difficult to distinguish from one another, especially towards the tip, each joint being covered with very long thin verticillate hairs, quite irregularly arranged. The antenna is as long as the whole body. *Thorax* reddish brown, closely punctured round the edge of the dorsum, a little in front of and between the three dorsal, almost concolorous stripes, the configuration of which is distinct, although they show only a slightly darker shade of colour; a narrow band, a little lighter in colour, just below the dorsum, is free of punctures, but the sides of the thorax, below this band, the scutellum, and the metanotum are all closely and conspicuously punctured. *Abdomen* linear, narrow, dark red-brown, a little blackish here and there, practically bare; belly similar. Genitalia blackish, rather small; a pair of slightly pubescent two-jointed claspers, with some internal organs, protected by an upper and lower plate. *Legs*: coxæ brownish yellow, bare; remainder of legs similarly coloured, gradually becoming darker towards the tips, the tarsi being blackish. *Wings* grey. Auxiliary vein apparently turning downwards into the 1st longitudinal vein at some little distance beyond the middle of the wing, and connected, just before its tip, by a short cross-vein with the costa. The 1st vein turns distinctly into the 2nd a little beyond the level of the anterior cross-vein, and a little way before its tip it is connected with the costa by a cross-vein, presumably the marginal cross-vein. The 2nd longitudinal, which begins some distance before the middle of the wing, gently arcuating, turns abruptly up (at the point where it meets

the anterior cross-vein, at a similar angle to that taken by the 4th vein in *Musca* and *Lucilia*) until it meets the 1st vein; thence running parallel to the costa and ending in it some little distance before the tip of the wing. The 3rd vein, which runs nearly straight to the exact tip of the wing, and the anterior cross-vein, originate together from the angle in the 2nd vein where the latter marks the end of the præfurca, this section being longer than the rest of the 2nd vein. Discal cell hexagonal, the lower half consisting of three sides, the cell twice as long as broad and about as long as the second and third posterior cells; anterior cross-vein shorter than proximal side of discal cell; posterior cross-vein just beyond middle of discal cell; 5th vein sharply angled at its juncture with the posterior cross-vein, whence it runs straight to the wing-margin; 6th and 7th veins nearly straight. The 1st, 2nd, and 3rd veins near their tips are microscopically spinose.

Length 6–6½ millim.

Described from three males in the Indian Museum from Kurseong, taken by Dr. Annandale, 18. v. 10 (*type*), 23. vi. 10, and 6. vii. 08.

Section *LIMNOBIINI.*

Eyes bare, separated by a comparatively narrow frons. Proboscis moderately long, elongate in at least one genus (*Geranomyia*); terminal lamellæ linear, narrow. Palpi four-jointed, slender, cylindrical. Antennæ of 14 joints (sometimes apparently 15); scapal joints of the usual type in LIMNOBIINÆ; flagellum of oval or cylindrical joints, more or less pectinate in *Rhypidia*. Genitalia of male consisting generally of a pair of two-jointed claspers, the 1st joint short, cylindrical or conical, the 2nd smaller, sometimes very much so, bearing, or consisting of, a horny hook, a bifid claw, or similar appendage. In the female the upper pair of valves may be shorter than the lower ones (*Dicranomyia*) or subequal in length; normal. Legs more or less slender, stouter in *Limnobia*, long; tibiæ without spurs at the tip; empodia indistinct or absent, ungues with teeth on the underside.* Wings moderately broad, sometimes elongate, with only one submarginal cell, four posterior cells, and the discal cell closed or open. Auxiliary vein ending about the middle or before two-thirds of the wing's length; subcostal cross-vein near its tip; submarginal cell longer than 1st posterior cell. The 2nd longitudinal vein usually begins a little before the end of the auxiliary vein, the subcostal cross-vein being therefore sometimes

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* As I have not studied this character myself, I quote Osten Sacken, who gave it much attention:—"The teeth on the underside of the ungues of the LIMNOBINA seem to be peculiar to this section. They must not be confounded with the more or less square or sharp projections on the underside at the very basis of the ungues, forming a part of the thickening which always exists there. The tooth in the LIMNOBINA, even when single, is distinct from this thickening, and placed before it." *Antocha* was the only genus known to Osten Sacken outside of the LIMNOBIINI that possesses a form of this tooth.

before and sometimes beyond the origin of the 2nd vein. Anterior cross-vein nearly always at some little distance beyond the origin of the 3rd vein; posterior cross-vein generally before the discal cell or at its base; 5th, 6th, and 7th veins nearly straight.

Table of Genera of LIMNOBIINI.

1. Eyes separated by a distinct frons in both sexes	2.
Eyes contiguous above and below antennæ in both sexes	5.
2. Proboscis conspicuously prolonged; always longer than head	GERANOMYIA, Hal., [p. 387.
Proboscis shorter than head	3.
3. Origin of the 3rd longitudinal vein normally situated, as also position of anterior cross-vein; the latter, with also the discal cell, always beyond (generally considerably beyond) the middle of the wing; posterior cells of normal length	4.
Origin of 3rd longitudinal vein, the position of the anterior cross-vein and discal cell all so proximal (about the middle of the wing) that all the posterior cells are exceedingly long	LIBNOTES, Westw., [p. 410.
4. Auxiliary vein ending as a rule considerably beyond origin of 2nd longitudinal vein, generally about half-way between that point and the tip of the 1st longitudinal vein. Genitalia of male with the 2nd joint of the claspers forming a horny hook	LIMNOBIA, Mg., [p. 396.
Auxiliary vein ending as a rule nearly opposite to or only slightly beyond the origin of the 2nd longitudinal vein. Genitalia of male with the second joint of the claspers generally large and fleshy	DICRANOMYIA, [Steph., p. 363.
5. Antennæ with a pair of pendant conspicuous processes attached to each joint of the flagellum on the lower side	CERATOSTEPHANUS, [Brun., p. 407.
Antennæ normal	ATYPOPHTHALMUS, [Brun., p. 408.

Genus **DICRANOMYIA**, *Steph.*

Dicranomyia, Stephens, Catal. Brit. Ins. ii, p. 243 (1829).
Siagona, Meigen, Syst. Beschr. vi, pl. lxv, fig. 7 (1830).
? *Glochina*, Meigen, *op. cit.* p. 280.
Numantia, Bigot, Ann. Soc. Ent. France (3), ii, p. 470 (1854).

GENOTYPE, *Limnobia modesta*, Mg.; designated by Coquillett, 1910.

Head: eyes large, glabrous, contiguous or subcontiguous below head, frons of moderate width. Proboscis subcylindrical, projecting, not longer than the head; palpi short. Antennæ 14-jointed, of moderate length, not reaching the root of the wing if bent

backwards; scape with the 2nd joint usually, sometimes considerably, enlarged; flagellar joints subglobular, elliptical or short subcylindrical, pubescent, the longer verticels of hairs differing considerably in length according to the species, being sometimes quite inconspicuous. *Thorax* normal, the anterior part prolonged into a distinct though not conspicuous neck, the side view of the prothorax triangular or subtriangular. *Abdomen* normal, of moderate size, linear, usually with parallel sides and soft short pubescence, which is often very inconspicuous or apparently confined chiefly to the sides and posterior borders of the segments; the segments in some species very distinct, in others much less so. Genitalia of male consisting of a pair of movable fleshy lobes, oblong, often subreniform, each armed on the inside with a short curved horny appendage, something like a beak, called by Osten Sacken a "rostriform" appendage, and often bearing on its convex side one or two stiff bristles. To the upperside of each of the lobes, another horny appendage, long, slender, attenuated, curved, is closely applied, and to these organs Osten Sacken gives the name of "falciform" appendages, their point of attachment being the horny, posteriorly pointed, basal plate below. Most of the different parts of the male organ appear liable to considerable modification in different species. In the female, the ovipositor is generally noticeable by its comparatively small size. The upper valves are short, narrow, arcuate, pointed, the lower ones straight. *Legs* generally slender, in some species, especially those of larger size, less so; usually more slender and often much longer than in *Limnobia*; the pubescence very inconspicuous, often microscopic. "Most of the species have a distinct tooth on the underside of the ungues, near the base, sometimes followed by a smaller one" (Osten Sacken). *Wings* somewhat elongate. Venation, though typical, showing considerable modifications within certain limits.* One submarginal and four posterior cells; discal cell generally closed. Auxiliary vein ending in costa opposite, or at a little beyond base of, 2nd longitudinal vein, that is to say, never very much before or beyond the middle of the wing; in occasional species it ends a little before the origin of the 2nd vein, and in quite exceptional cases considerably beyond this point. Subcostal cross-vein placed in different species at different distances from the tip of the auxiliary vein, its position, however, being constant in the same species. The 1st longitudinal vein ends in the costa near the end of the nearly always present stigma, more or less beyond the inner end of the submarginal cell, sometimes ending as far distally as the middle of this cell. † The marginal cross-vein placed near tip of 1st vein, often more or less in a line with the upturned end of the latter, but also often quite distinctly appearing as a true cross-vein, a little anterior to the tip of the

* Especially when the species of the whole world are considered.
† *Vide* notes on venation, *post*.

1st vein. The 2nd longitudinal vein begins in the middle of the wing, either at an acute angle or in a curve of varying sweep, gently bisinuate: its basal section (that is to say, that portion from its origin to the emergence of the 3rd vein, or the præfurca) straight or rather distinctly curved, varying from one-half to one-fourth the total length of the vein. The 3rd vein with the basal section of varying length, according to the species, but tolerably constant in each species;* its course also varies considerably, sometimes gently bisinuate, in some species forming nearly a rectangle both at its origin from the 2nd and at its elbow, in most species parallel to the 2nd longitudinal vein or slightly diverging or converging at the tip. Owing to the 3rd vein emerging from the 2nd at some distance beyond the base of the latter, the submarginal cell is always considerably shorter than the marginal cell, and nearly always longer than the 1st posterior cell. Anterior cross-vein always situated at the upper basal corner of the discal cell. Discal cell generally present,† generally more or less elongate, usually pentagonal, the distal side formed (as is the general rule in TIPULIDÆ) of two short veinlets forming the basal sides of the 2nd and 3rd posterior cells, of which the 3rd is generally a little longer than the 2nd. When the discal cell is absent, it is generally coalescent with the 2nd posterior cell. ‡ The 4th vein, when the discal cell is open, has either the upper or the lower branch forked, in most cases the latter. Posterior cross-vein placed exactly at or a little before the base of the discal cell, but its position varies to an appreciable degree even in the same species. The 5th, 6th, and 7th longitudinal veins nearly straight, or slightly curved downwards at the tip.

Range. Europe, North America, West and South Africa, the Orient, and Australasia.

Notes on the venation.—The marginal cross-vein is generally in a line with the upturned tip of the 1st longitudinal vein, but in some species (the feature also adventitiously occurring in an otherwise normal species) it bends a little proximally at its upper end, thus making it appear as if the 1st vein itself turned downwards at its tip into the 2nd vein, whilst being joined by a short cross-vein to the costa.

There is a figure in Needham's plates of an American species (*D. immodesta*, Os. Sac.) in which the 1st longitudinal is distinctly shown turning down into the 2nd at its end, no cross-vein being shown at all. This, it seems to me, may well be an error, as the

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* In *D. fascipennis*, Brun., it is as long as the basal section of the 2nd vein; in *D. ornatipes*, Brun., it is rather shorter than the auxiliary vein.

† Absent in at least two North American species (*D. immodesta*, Os. Sac., and *cinerea*, Doane), also in some Oriental species (*D. absens*, Brun., *kobusi*, Meij., and *tenella*, Meij.).

‡ Osten Sacken mentions a North American species, *D. pubipennis*, which normally has the discal cell closed, but out of twenty specimens of it seen by him, five had it open, and in each case it coalesced with the *3rd* and not the 2nd posterior cell.

species is one of Osten Sacken's own, and he would surely have mentioned the fact in his monograph, yet he does not do so, although referring to this particular species on another point. Needham also illustrates the wing of another somewhat abnormal species, *D. cinerea*, Doane. Neither subcostal nor marginal cross-vein is present; the 2nd vein is comparatively short, turning upward at its tip; the discal cell is open, coalescing with the *3rd* posterior cell, which is pointed proximally, the upper branch of the 4th longitudinal vein being forked.

A still more abnormal venation is shown by *D. whartoni*, Needham, which this author refers doubtfully to *Dicranomyia*. The marginal cross-vein divides the marginal cell; the subcostal cross-vein is absent; the discal cell is open, coalescing with the 2nd posterior cell, of which latter (posterior) cells there are only three, through neither branch of the 4th longitudinal vein being forked; the posterior cross-vein is anterior to the base of the 2nd posterior cell; the 7th vein very short, and the whole wing more elongate than in any species I have seen.

Affinities of the genus Dicranomyia.—Very close to both *Limnobia* and *Geranomyia*. The latter genus is, of course, quite easily distinguished at once from both the others by its elongated proboscis, which is immediately conspicuous. Apart from this feature, however, the three genera have much in common, the present genus being especially akin to *Limnobia*.

In the venation the most conspicuous difference is the position of the tip of the auxiliary vein, which in *Dicranomyia* ends in the costa nearly opposite the origin of the 2nd longitudinal vein, just beyond it or, in a few cases, a little before it. In a few exceptional cases it is continued some distance beyond the origin of the 2nd vein; Osten Sacken mentions this regarding four North American species. In *Limnobia* the auxiliary vein nearly always ends considerably beyond the origin of the 2nd longitudinal vein, generally about half-way between that point and the tip of the 1st vein.*

The differences in the male genitalia consist rather of modifications of the same plan of structure than of fundamental differences of form. The claspers in *Dicranomyia* are large and fleshy, whilst in *Limnobia* the second joint develops into a strong horny hook-shaped process.

The relative position of the subcostal cross-vein and the tip of the auxiliary vein is somewhat different in the majority of species of both genera, for though the cross-vein is in both sometimes placed at the tip of the auxiliary vein, in *Dicranomyia* it is *invariably* situated between the 1st vein and the auxiliary vein, joining them together; in *Limnobia* it is *very often* placed between the auxiliary vein and the costa, uniting those two veins, in which

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* Osten Sacken mentions only one exception known to him in 1869, the European *D. macrostigma*, Schum. I have found it so in one Oriental species, which I am referring to *Limnobia*, i. e., *L. festiva*.

case the auxiliary vein ends in the 1st longitudinal and not in the costa as usual.*

In *Dicranomyia* the marginal cross-vein is always at the tip of the 1st longitudinal, and generally in a straight line with it. In *Limnobia* it is often some distance before the tip, occurring in the middle of the stigma or even at its basal end, and when this occurs it is generally in the less typical species of the genus. In typical *Dicranomyia* the marginal cross-vein is close to the tip of the 1st longitudinal vein.

The discal cell is often open (adventitiously or as a specific character) in *Dicranomyia*, but hardly ever so in *Limnobia*. A difference between these two genera is also noticeable in the larval stages, as the larvæ of *Dicranomyia* are aquatic or subaquatic, whereas at least some species of *Limnobia* are known to breed in wood and fungi.

Differential characters of minor importance may be found in the general facies, in *Dicranomyia* the legs being comparatively longer and more slender, in *Limnobia* generally shorter and stouter; further, the coloration of the present genus is generally sombre, grey, blackish, and brownish, whereas in *Limnobia* there are numerous brightly coloured yellow and orange species, with conspicuous black marks, often on the wings as well as on the bodies. Some species of *Dicranomyia* have delicately marked wings.

Life-history. The larva is aquatic or subaquatic, some of the species apparently preferring running water. Osten Sacken found the larva of one species (probably *D. defuncta*, Os. Sac., which, according to Aldrich, =*simulans*, Walk.) on the woodwork of a mill-dam, with a stream of water constantly passing over it; in fact, that author frequently saw the flies themselves alight on stones and rocks over which a very thin sheet of water was running. Winnertz records rearing the Palæarctic species *D. dumetorum*, Mg., from decaying beech-stumps (Linn. Entom. viii, p. 281).

The perfect insects are found in woods, especially near streams and small trickling miniature water-falls. They not infrequently occur in houses, often attracted by an artificial light at night.

Table of Species.

1.	Ground-colour of wing marmorated by the presence of numerous very small pale grey spots, in addition to darker and more conspicuous markings	2.
	Ground-colour of wing never marmorated .	3.
2.	Legs pale yellow; tips of femora, especially fore pair, widely black; wings pale grey, with darker small spots, no larger spots on costa	*marmoripennis*, sp. n., [p. 369.

* Osten Sacken notes that this latter peculiarity, viz., the subcostal cross-vein being situated so as to unite the auxiliary vein and the costa, was not known to him to exist in any other genera of TIPULIDÆ.

Legs dark, tips of femora darker; wings dark grey, with small pale spots, including two larger yellowish grey triangular ones on the costa	*demarcata*, sp. n., p. 370.
3. Discal cell absent	4.
Discal cell present	6.
4. Upper branch of 4th longitudinal vein forked; discal cell coalescent with 2nd posterior cell	5.
Upper branch of 4th vein not forked, nor lower branch either	*tenella*, Meij. (not Indian).
5. Femora yellow with broadly black tips; tibiæ white, with black rings; tarsi white	*kobusi*, Meij., p. 371.
Legs uniformly brownish yellow, no rings; no white tarsi	*absens*, sp. n., p. 372.
6. Tarsi mainly snow-white, or hind pair only (in *longivena*)	7.
Tarsi unicolorous, or at least never snow-white	8.
7 (*a*). Tarsi all white (presumably), including metatarsus	*cuneiformis*, Meij., [p. 372.
(*b*). Tarsi with at least the middle pair concolorous with the brown femora and tibiæ	*longivena*, Edw., p. 374.
(*c*). Metatarsi dark on basal third or half *.	*saltans*, Dol., p. 373.
8. Thorax with dorsum wholly deep shining black	*nigrithorax*, sp. n., [p. 385.
Thorax never deep shining black: if black, then dull; if shining, then not deep black, mostly yellowish, brownish yellow or grey	9.
9 (*a*). Wing with three or five very distinct dark spots on costa	10.
(*b*). Wing without conspicuous dark spots on costa, but with sufficiently numerous distinct spots or marks to be obvious as a pattern	12.
(*c*). Wing barely marked at all, such marks faint, small, or not distinctly obvious ..	14.
10. Wing with five very conspicuous spots on costa included in a general pattern	*pulchripennis*, sp. n., [p. 376.
Wing with only three conspicuous spots, not so much a part of any general pattern	11.
11. Femora without apical black ring; posterior cross-vein distinctly before discal cell	*puncticosta*, sp. n., [p. 377.
Femora with distinct narrow apical black ring; posterior cross-vein in a line with discal cell	*fraterna*, sp. n., p. 378.
12. Two round small grey spots in axillary cell	*fascipennis*, sp. n., [p. 379.
No such spots in axillary cell............	13.

* That is if I have identified the species correctly, although Doleschall says simply "tarsi snow-white."

13. Femora with subapical black ring; 3rd longitudinal vein originating at a right angle, not in a line with the anterior cross-vein .... *ornatipes*, sp. n., p. 380.
Femora without subapical black ring; 3rd longitudinal vein originating in an acute angle, some distance before anterior cross-vein .... *subfascipennis*, sp. n., [p. 380.
14. Thorax light yellowish grey, with three distinct dorsal black stripes .... *cinerascens*, sp. n., [p. 381.
Thorax uniformly yellowish, or brownish yellow, no distinct dorsal black stripes .. 15.
15. Abdomen with conspicuous white bands on belly .... *cinctoventris*, sp. n., [p. 382.
Abdomen without bands on belly .... 16.
16 (*a*). Base of 4th vein, base of 2nd vein, and stigma infuscated; species with dark brownish grey body and legs .... *sordida*, sp. n., p. 382.
(*b*). Base of 2nd vein and stigma and base of 3rd vein infuscated; delicate thin yellow-legged species, with pale iridescent wings .... *delicata*, sp. n., p. 383.
(*c*). Infuscation confined to the stigma, and there faint; yellow, moderately robust species.............................. *fortis*, sp. n., p. 385.
(*d*). Practically no stigma, wings clear; brownish yellow, moderately robust species; auxiliary vein ending distinctly beyond origin of 2nd vein; veins distinct. *flavobrunnea*, sp. n., [p. 384.
(*e*). Wings clear........................ *simplex*, sp. n., p. 384.

The above seems to be the best table that can be drawn up in the present state of our knowledge, and must not be considered as a final differentiation of species, still less as a guide to their affinities. The order in which the descriptions are arranged is intended to represent the affinities as nearly as can be judged at present. It is highly probable that the total number of species occurring in the Indian Empire is double or treble that at present known. If the genus *Thrypticomyia*, Skuse, be admitted, the species in the above table from *kobusi* to *saltans*, inclusive, will come in it.

257. Dicranomyia marmoripennis, sp. nov. (Pl. VII, fig. 3.)

♂ ♀. *Head* dark grey, also proboscis; palpi blackish; antennæ all yellow. *Thorax*: dorsum entirely bright brownish orange, in which the outline of the usual three contiguous stripes and two large post-sutural spots can be traced. In the female the colour is much darker brown, the outline of the stripes being much fainter. Scutellum concolorous, or a little darker; metanotum pale yellow with a very broad dark brown median stripe; sides of thorax pale yellow, the colour very sharply demarcated from that of the dorsum, at a level just above the wing-base; a wide,

deep black stripe along the middle of the whole length of the side, and below this a thin dark reddish brown line across the mesosternum and all the coxæ. *Abdomen* brown or reddish brown, with a little short pale pubescence. Belly similar. Genitalia of male yellowish brown, consisting of a dorsal plate, concolorous with the dorsum of the abdomen, a lower projecting flat narrow piece, a pair of large moderately pubescent claspers, and one or two inner pairs of organs not easily perceptible. Ovipositor of female brownish yellow, small, with a few golden yellow hairs. *Legs* uniformly yellow, with a broad black apical ring on all the femora and with the tips of the tibiæ black; tarsi with the apical half of the anterior pairs and the whole of the hind pair black. *Wings* pale grey, with numerous faint, grey, minute spots and some darker spots. Auxiliary vein ending at about one-third of the distance between the origin of the 2nd vein and the tip of the 1st; the 2nd longitudinal vein originating at the middle of the wing, the præfurca distinctly less than half the length of the vein; basal part of 3rd vein elbowed almost immediately, nearly as long as the præfurca, and four times as long as the 2nd and 3rd posterior cells; anterior cross-vein at upper corner of discal cell; posterior cross-vein a little before the discal cell. The whole surface of the wing is mottled with very small pale grey spots, in addition to which there are some darker brown marks and suffusions as follows:—Over origin of 2nd vein and tip of auxiliary vein; tip of 1st vein and the marginal cross-vein, which latter is situated near the tip of the former; base of 3rd vein, this being the largest mark, though actually of only moderate size. A very slight suffusion occurs at the tip of the 2nd vein; over both cross-veins; on upper part of outer side of discal cell, and at tip of 7th vein. Halteres yellow.

Length, ♂ 4, ♀ 6 millim.

Described from a type male and female from Kurseong, 5. ix. 09 (*Annandale*), and other specimens from Bangali, Bengal, 14. x. 10 (*Annandale*), Katihar, Bengal, 7–31. viii. 10 (*Paiva*); a specimen from Darjiling, 8. viii. 09 (*Paiva*), of uncertain sex, the abdomen being missing—all these being in the Indian Museum. Also from some in the Pusa collection from Darjiling, 3–9. vi. 09 (*Howlett*), and from Pusa.

258. **Dicranomyia demarcata**, sp. nov.

♀. *Head* dark grey; antennæ and palpi blackish. *Thorax*: dorsum very dark brown, the colour produced forwards in the centre as far as the anterior margin; two very narrow light grey lines, giving the dorsum, in front of the suture, the appearance of having three subcontiguous dark stripes of the usual pattern; the depressions behind the suture with some greyish reflections. Sides of thorax moderately light grey, the colour sharply delineated from the dark dorsum; pleuræ and lower part of the thorax blackish; scutellum and metanotum brown or brownish yellow.

Abdomen black, the hind margins of the segments well-defined, slightly thickened. Belly similar but somewhat pale at base, and the hind margins of the segments less prominent. Ovipositor brownish yellow, rather large, slightly pubescent. *Legs* dark brown, except the coxæ and the basal half or two-thirds of the femora, which are dirty brownish yellow, the tips nearly black, and distinctly though slightly incrassated. *Wings* dark grey, with very small pale grey spots and short streaks generally distributed, the two largest of these spots being on the costa, approximately triangular in shape and with a distinct yellowish tinge; the first is placed just before the origin of the 2nd longitudinal vein and has two small round dark grey spots in it touching the costa; the second is just before the blackish ill-defined stigma. Halteres pale yellow.

Length 5 millim.

Described from a single female in the Indian Museum, taken by Dr. Annandale at Kurseong, 15. iv. 11.

A very distinct species from all other Oriental ones of the genus, the well-defined grey part of the sides of the thorax and the mottled wings distinguishing it at once.

259. Dicranomyia kobusi, *Meij.*

Dicranomyia kobusi, Meijere, Bijd. Dierk. xvii, p. 91 (1904).

♂ ♀. *Head* yellowish; antennæ brown, 14-jointed. *Thorax* rather prominent anteriorly, dorsum darker, sharply demarcated from the whitish sides; metanotum brownish, with some white reflections. *Abdomen* brown, posterior margins of segments often clearer, but lighter in other parts in some specimens; belly generally lighter. Genitalia apparently normal in both sexes, somewhat small. *Legs*: fore femora brownish yellow, broadly black at tips, posterior femora dark brown or blackish, middle pair distinctly yellowish towards tips; all femora slightly and gradually thickened distally; tibiæ white, with a moderately broad blackish band just beyond the middle and occasionally traces of a similar band near the base; tarsi wholly white. The white portions of the legs bear very short snow-white pubescence. Claws with the usual bump at base, entirely without teeth, pulvilli rudimentary. *Wings* long and narrow, almost clear, with small circular dark brown or black stigma. Discal cell absent, coalescing with 3rd posterior cell; the veins much more crowded towards the tip of the wing than in *D. saltans*, so that the arc formed by the basal portions of the 2nd and 3rd longitudinal veins together with the cross-veins, is situated at two-thirds the length of the wing. Halteres pale with black knobs.

Length 4–5 millim.

Re-described from six males and one male and female *in cop.* in the Indian Museum, from Kurseong, 20–25. vi. 10 and 5. vii. 08 (*Annandale*).

Type ♂ and ♀ in the Amsterdam Museum, from Java.

If *Thrypticomyia*, Skuse, be a valid genus, which seems doubtful, the present species will fall into it.

260. **Dicranomyia absens**, sp. nov. (Pl. VII, fig. 2.)

♀. *Head* grey; frons moderately wide, the sides parallel, grey, with a median irregular row of small black spots; eyes contiguous below. Proboscis yellow; palpi blackish. Antennal scape blackish, flagellum yellowish brown or brown. *Thorax* light grey, the dorsum mainly occupied by the usual three contiguous stripes of brownish grey, the median one attaining the anterior margin; two post-sutural large unicolorous spots, the post-sutural depression greyish; sides of thorax yellowish, with greyish reflections here and there. Scutellum and metanotum more yellowish grey, dusted with light grey. *Abdomen* dark brown, with a little pale pubescence; margins of segments slightly paler. Belly similar; ovipositor reddish yellow. *Legs* yellowish; tips of tarsi a little blackish. *Wings* clear, highly iridescent. Auxiliary vein ending just after the origin of the 2nd longitudinal vein, which begins beyond the middle of the wing; the præfurca much shorter than the remaining portion; marginal cross-vein at tip of 1st longitudinal vein, much before the middle of the marginal cell; base of 3rd vein twice as long as anterior cross-vein. Discal cell open, coalescing with 2nd posterior cell; 3rd posterior cell a little more than twice as long as wide; posterior cross-vein just before, just beyond, or in a line with the basal side of the discal cell; stigma pale blackish, oblong, just perceptible.

Length $4\frac{1}{2}$ millim.

Described from two females from Kurseong, 25. vi 10, type (*Annandale*), and Darjiling, 5. viii. 09 (*Paiva*).

Type in the Indian Museum.

The want of fixity in the position of the posterior cross-vein is clearly shown in the two specimens of this species, in one of which it is just (but distinctly) beyond the base of the absent discal cell; in the other it is before this base in one wing of the specimen and exactly in a line with it in the other wing.

261. **Dicranomyia cuneiformis**, *Meij.*

Dicranomyia cuneiformis, Meijere, Tijd. Entom. liv, p. 23, ♂ (1911).

♂ ♀. *Head* and antennæ brown, palpi blackish brown. *Thorax* very short, dark brown, moderately shining, yellowish behind; scutellum brown, shining; sides brownish yellow. *Abdomen* very narrow, blackish brown; in female, over four times as long as thorax. Genitalia of male long and narrow; of female, moderately long, onion-shaped. *Legs* dark brown, femora brownish yellow towards base; metatarsus nearly as long as the tibia, basal half dark brown, remainder of tarsi whitish. *Wings* very narrow, of the same length as the abdomen (including ovipositor);

the basal part extremely contracted, without vestige of alula or anal angle, increasing gradually in width to the widest point, this being beyond the middle of the wing. Stigma brownish, distinct but ill-defined. The 2nd longitudinal vein begins at fully four-fifths the length of the wing, the adjacent veins below it being more crowded distally than even in *D. kobusi.* Discal cell present, oblong, inner side nearly in a line with the cross-veins, the cell about as long as the 2nd and 3rd posterior cells. Halteres very long and slender, pale, clubs black.

Length, ♂ 7, ♀ 6 millim.

In the above description the characters of the male are adapted from Meijere, the female (previously unknown) being described from a single example of this sex in the Indian Museum from the Dawna Hills, 2000–3000 ft., 2–3. iii. 08 (*Annandale*).

Type ♂ in the Amsterdam Museum.

Meijere only described the male from a single specimen from Java, but from the peculiar shape of the wing and the characteristic venation there can be no possible doubt as to the identity of the species. The difference in the wings of *D. saltans* and *cuneiformis* is sufficiently striking when the two species are placed side by side. Besides being distinctly narrower in *cuneiformis*, the 2nd longitudinal vein originates beyond three-quarters the length of the wing, and (reckoning from the origin of the 4th longitudinal) the inner end of the discal cell is placed at four-fifths of the wing's length, whilst in *saltans* it occurs very distinctly before that distance. In Meijere's species the veins from the 2nd longitudinal hindwards are much more removed to the tip of the wing than in *saltans*.

It may be noted that both Doleschall and Meijere describe the tarsi of their respective species as snow-white. This is indeed so, but the basal part of the metatarsus (varying from a third to a half) is dark, like the tibia. This is apparently an oversight, as it is not always easy to define the exact limits of each tarsal joint.

Mr. Edwards refers this species also to *Thrypticomyia*, a genus in which the basal part of the wing is extremely narrowed, without any vestige of an anal angle. Personally I have my doubts of the validity of *Thrypticomyia* on account of intermediate forms.

262. **Dicranomyia saltans**, *Dol.*

Limnobia saltens, Doleschall, Nat. Tijd. Ned. Ind. xiv, p. 390, pl. ii, fig. 3 (1857).

♂ ♀. *Head* obscure brownish yellow; proboscis and antennæ a little clearer; palpi dark. *Thorax* brownish yellow, the posterior half distinctly lighter, including scutellum and metanotum. *Abdomen* brownish yellow, brown or blackish; genitalia normal. *Legs* brown, a little yellowish on coxæ and base of femora, the tips of the femora very slightly thickened; basal half of metatarsi black, the remainder of the tarsi snow-white. *Wings* clear pale yellow,

quite colourless at base, and slightly but distinctly infuscated at tips; an oval, rather large and distinct brown stigma at tip of 2nd longitudinal vein. The 2nd longitudinal vein originates beyond middle of wing; the 3rd begins just before middle of 2nd, so that the veins appear crowded towards the tip of the wing. Halteres pale with black knobs.

Length 4 millim.

Redescribed from four males and one female in the Indian Museum from Nedumangad, Travancore State, South India, 14. xi. 09 (*Annandale*). The species is also known from Java and the Philippines, and is most probably generally distributed throughout the East.

Type. The location of this is unknown, and the probability is that it is entirely lost.

It seems to me that the *Limnobia apicalis* of Wiedemann is probably identical with one of the more recently described species with white tarsi, or else with *D. saltans*, Dol. If so, the name will take precedence of all others. Mr. Edwards * calls the species *saltens* instead of *saltans* (the former being the name given by Doleschall), and places it in *Thrypticomyia*, Skuse, but the stability of this latter genus appears doubtful, and the emendation of Doleschall's name seems legitimised by long usage.

263. Dicranomyia longivena, *Edw*

Thrypticomyia longivena, Edwards, Ann. Mag. Nat. Hist. (8) viii, p. 58 (1911).

♀. "Ochracea, alis hyalinis, tarsis pedum posticorum albis; vena mediastinali post ortu præfurcæ in costa terminata."

"*Head* †: antennæ brownish, slightly longer than thorax; 14-jointed, last joint with the apical joint narrower, so that it has the appearance of being divided. Joints of flagellum strikingly pedicillate, the glabrous pedicels occupying from one-third to one-half the length of the joint, and being only one-quarter as broad as the broadest part; broad portion more or less conical, the apex of the cone being towards the base of the joint; these broad portions are provided with a verticel of fine hairs, three or four shorter bristles and one longer dorsal bristle, the hairs being two-thirds, the shorter bristles about one and a half and the longer about two and a half times as long as the breadth of the conical portion of the joint. *Thorax* ochreous, mesonotum with a rather broad dark brown central stripe reaching back to the suture. *Abdomen* only slightly constricted at base, brown, apical segments

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* Ann. Mag. Nat. Hist. (8) viii, p. 58 (1911).

† The order of placing the descriptions of the various parts of the body is slightly altered for the sake of uniformity with the remainder of the present work.

ochreous, venter ochreous. *Legs* rather dark brown, coxæ and femora towards base ochreous, posterior tarsi and apical fifth of tibiæ white, tarsi somewhat brownish-tinged at tip; middle tarsi brown like the femora and tibiæ. Posterior tarsi scarcely more than half, middle two-thirds, as long as their tibiæ. Anterior legs missing. *Wings* hyaline, with golden reflections, but less brilliant than in the other species of the genus; a distinct though rather diffused stigma. The wing has the typical cuneiform shape,* but there is a slight indication of an anal angle. Base of basal cells at one-quarter of wing-length, mediastinal † vein reaching costa much beyond origin of præfurca, about half-way between that and the apex of the 1st longitudinal vein. Subcostal cross-vein close behind apex of mediastinal vein. Marginal cross-vein and tip of 1st longitudinal rather indistinct, forming an obtuse angle about the middle of the stigma. Discal cell subquadrate, great cross-vein about one-third of the way along its lower side. Halteres rather long, stalk ochreous-brown, knob dark brown.

Length 4·5 millim., of wing 5 millim." (*Edwards.*)

Described from a single female taken at Dondra, Ceylon, 3. xii. 07 (*T. Bainbrigge Fletcher*).

Type in the British Museum.

Mr. Edwards adds: "This species must apparently come in the genus *Thrypticomyia*, though, like *T. saltens*, it shows considerable divergence from the type, notably in the long mediastinal vein, the less elongated wings and the less constricted abdomen. Unfortunately we have no male."

A character by which this species may be easily distinguished from the others possessing white tarsi, is that only the hind pair ("posterior," Mr. Edwards terms it) are white, the middle pair being concolorous with the middle femora and tibiæ. The fore tarsi (missing in the type) may be brown or white; more probably the former.

This species is retained in *Dicranomyia* in the present work, as it seems better placed here. The wing shows a trace of an anal angle, which in my opinion suggests that other species exist of a sufficiently intermediate nature to break down this definition as a generic character. The absence of a supernumerary subcostal cross-vein also excludes the species from *Thrypticomyia*, Skuse. The relative lengths of the different veins in species of *Dicranomyia* are very variable. Were it not that the typical species of Skuse's genus is represented by six specimens the additional cross-vein might have been presumed to be accidental.

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* Edwards is of course referring to the genus *Thrypticomyia*, in which he places his species, and in which the cuneiform shape of the basal part of the wing is a generic character.

† Synonymous with auxiliary vein.

264. **Dicranomyia pulchripennis**, sp. nov. (Pl. VII, fig. 8; Pl. XI, fig. 2.)

♂ ♀. *Head* dark brownish grey, with rather long pale hairs; much flattened behind vertex, produced posteriorly; frons similarly coloured, about one-fourth the width of the head (at the level of the vertex), widening a little below. Proboscis dark brownish grey, with minute gold pubescence; palpi blackish, sparsely hairy. Antennal scape dark brown, sparsely haired, 2nd joint rounded, reddish yellow; flagellum yellow, the joints oval, becoming more elongated towards the tip, bearing a few hairs each. *Thorax*: neck long, dark grey, a blackish stripe on the dorsum, and blackish where it joins the distinctly produced prothorax. Dorsum of thorax light grey, mainly occupied by three contiguous black stripes, of the usual pattern; the outer ones abbreviated in front, with a faint trace of a greyish line dividing them from the median one; blackish behind the suture, the post-sutural depression rather widely grey. Scutellum and metanotum dark brownish grey, with whitish grey reflections seen from behind; sides of thorax dark grey, with lighter parts here and there. *Abdomen* blackish or dark brownish grey, with very short pale yellow pubescence. Belly similar. Genitalia of male reddish brown with yellow hairs; an upper plate with a pointed bright reddish brown piece projecting from underneath; a pair of large claspers, each joint large and fleshy, the second one ending in a small claw; a ventral plate with reddish yellow hairs on the posterior margin. Apparently there is a pair of smaller intermediate organs. Ovipositor of female large, somewhat complicated; the upper valve bright brownish yellow, the lower one dark brown at the base, yellow at the tip. *Legs*: coxæ blackish; remainder of legs yellow; femora with a distinct black ring at tip, tibiæ narrowly black at base and tip; tarsi black, except the basal half of metatarsus. *Wings* pale grey, with a fairly well-defined pattern of brown marks on the anterior portion and pale grey ones on the posterior. Auxiliary vein ending opposite the 2nd longitudinal vein, which begins beyond the middle of the wing; marginal cross-vein distinctly beyond middle of marginal cell, and at tip of 1st longitudinal; præfurca nearly half the length of 2nd vein; basal section of 3rd vein very oblique, double the length of the anterior cross-vein, which is half as long as the basal side of the discal cell; discal cell twice as long as broad, much wider distally, longer than 2nd posterior cell, equal (posteriorly) to 3rd posterior cell; posterior cross-vein some little distance anterior to discal cell; the 7th vein rather sinuous, tip bent down rather sharply. The markings consist of a brown spot on the costa near the base, with a minute clear spot in the middle. Two nearly contiguous, sub-triangular spots follow, on the costa, extending into the 1st basal cell, each spot with a small clear space in it, this clear space placed on the costal margin. A

large apical brown spot of irregular shape, its inner edge nearly parallel to, but distinctly separated from, the 2nd triangular spot; its lower edge running horizontally to the margin, just above the 3rd longitudinal vein; an irregular diagonal clear streak near the centre of this apical brown spot, one end (of the clear streak) being near the base of the 2nd submarginal cell, the other end being nearly or wholly on the costa; this clear space sometimes broken up into two or more spots. On the hind margin of the wing there are three pale grey sub-triangular spots placed almost opposite the similar ones on the costa; also a fourth spot, situated on and beyond the tip of the 5th vein. The remainder of the posterior margin is also darker, and the cross-veins are infuscated, as is also the 5th longitudinal vein throughout its length, whilst in some specimens the 4th longitudinal is also infuscated. Additional small spots occur adventitiously in individuals, and the general pattern of the wing is subject to individual modifications. Halteres pale yellow, clubs black.

Length 7½–8½ millim.

Described from a good series of both sexes in the Indian Museum from Darjiling, 5–10. viii. 09 (*Paiva*); 26–27. v. 10, taken by me on wet bushes after rain, on the hillside; 4. ix. 09 (*Annandale*); Mussoori, 18. vi. 05 and 17. viii. 05 (*Brunetti*); Mussoori, x. 06, and Simla, x. 08 (both in the Pusa collection); Bhowali, Kumaon district, 5700 ft., x. 09 (*Imms*).

Types in the Indian Museum, cotypes in my collection.

265. **Dicranomyia puncticosta**, sp. nov. (Pl. VII, fig. 7.)

♂ ♀. *Head* grey or yellowish grey, back of head with numerous long black hairs. Frons pale yellow, one-fifth the width of the head; eyes very narrowly separated on the underside of the head. Proboscis brown, sometimes black at tip; palpi brown, 1st joint narrow, cylindrical, 2nd broad, sub-triangular, 3rd and 4th broader at tip than base, less wide than 2nd, subequal in length. Antennal scape brown; flagellum pale yellowish or brownish yellow, with verticels of not long hairs. *Thorax*: neck yellowish, with the dorsum more or less blackish. Mesonotum pale brownish yellow; scutellum and metanotum, and pleuræ sometimes, a little paler. From the three examples present, the normal form would appear to possess a broad brown median stripe, which widens posteriorly, until behind the suture it occupies nearly all the dorsum, but its colour diminishes in intensity in that part. One example (*type*) shows only a vestige of this median stripe, the whole thorax in this individual being pale yellowish. In the female the dorsal brown stripe is darker and carried uninterruptedly over the scutellum and metanotum; and there is also a distinct short dark brown lateral stripe on each side of the thorax. *Abdomen* yellowish, with a few pale hairs at the sides; emargination of segments a little brownish in male. Belly similar. Abdomen of female brown. *Legs*: coxæ and femora yellowish, the latter

with the tips sometimes slightly blackish; tibiæ and tarsi brownish. *Wings* pale yellowish grey, highly iridescent. Auxiliary vein ending barely beyond tip of 2nd longitudinal, which begins at the middle of the wing, the præfurca forming not quite half the length of the vein; basal section of 3rd vein very oblique, twice as long as the anterior cross-vein; marginal cell much longer and wider than the submarginal; discal cell as long as or a little longer than 2nd and 3rd posterior cells, twice as long as broad; posterior cross-vein placed just before discal cell. The several distinct brown spots with which the wing is marked are placed as follows:—three on the costa, the 1st over the humeral cross-vein (sometimes faint), the 2nd over the base of the 2nd vein, the 3rd over the marginal cross-vein; another over the origin of the 3rd vein. The basal and distal sides of the discal cell are infuscated, as are also both cross-veins, the 5th longitudinal vein throughout its length, the tips of the 6th and 7th veins and, to a slight degree, the tips of some of the other veins. Halteres pale yellow.

Length 5 millim.

Described from two males (*type*) and one female from Kurseong, 4. ix. 09 (*Annandale*); and an additional male and the type female from Darjiling, 8. viii. 09 (*Paiva*).

Types ♂ and ♀ in the Indian Museum.

In spite of the differences in the markings on the thorax, I cannot but regard all three specimens as representing but one species. The second male example possessing no abdomen, there is no alternative but to make the one with the thorax nearly wholly yellow the type of the species. The wing-markings agree perfectly in all three examples, except that the basal costal spot is fainter in the type male.

266. **Dicranomyia fraterna**, sp. nov. (Pl. VII, fig. 5.)

♀. Very near *D. puncticosta*, but differing in the following characters:—

Head: the frons about one-sixth the width of the head, at its narrowest, and widening rapidly above and below the middle line. *Thorax* grey, with a yellowish tinge, and three distinct brown or brownish grey dorsal stripes (absent in one specimen), narrowly separated, the median one attaining the anterior margin; the brownish grey colour continued behind the suture, and the metanotum of the same shade. Scutellum dirty yellowish white. *Abdominal* segments darker brown, with a trace of lighter brown on the hind margins, especially towards the sides. Ovipositor reddish yellow. *Legs* differing from those of *D. puncticosta* by the distinctly black tips to the femora, the tibiæ being more yellowish. *Wings* clear, with very pale grey spots placed as follows:—Just below humeral cross-vein; over tip of auxiliary vein, embracing base of 2nd vein; an intermediate costal spot between these two; a comparatively large one (but no darker)

forming the stigma, square in shape, ending just beyond the marginal vein, and contiguous to a round one over the origin of the 3rd longitudinal. Basal and distal sides of discal cell, with posterior cross-vein, just perceptibly infuscated.

Length 5–6 millim.

Described from three females from Darjiling, 5–8. viii. 09 (*Paiva*).

Type in the Indian Museum.

Although so closely related to *D. puncticosta*, this form seems sufficiently characterized by the three distinct thoracic stripes (although absent in one individual), the black ring on all the femora, and the clear, not yellowish grey, wing, with a less number of markings.

267. **Dicranomyia fascipennis**, sp. nov. (Pl. VII, fig. 9.)

♀. *Head*: frons narrow, with back of head dark grey. the latter with pale hairs; proboscis dark brown, palpi blackish; antennæ brownish yellow. *Thorax* dark yellowish grey, with a median, barely darker brownish stripe, ending at the suture. Scutellum and metanotum, also sides of thorax, yellowish brown. *Abdomen* dark brown, with very short sparse pale hairs. *Legs* uniformly brownish yellow. *Wings* clear. Auxiliary vein ending immediately before the base of the 2nd longitudinal, which begins just beyond the middle of the wing; the 1st longitudinal ending just before the middle of the marginal cell; marginal vein distinct, placed exactly at the bend in the 1st vein where it turns up to the costa, this section of it being very indistinct, making it appear as though the 1st vein turned downwards at its tip, meeting the 2nd vein; præfurca less than half as long as the remainder of the vein, tip of vein turned sharply upwards at tip; basal section of 3rd vein two and a half times as long as the anterior cross-vein, which latter is as long as the basal side of the discal cell; discal cell nearly oblong, slightly broader towards the tip, three times as long as broad, rather longer than the 2nd and 3rd posterior cells; posterior cross-vein in a line with base of discal cell. The markings of the wing consist of pale grey spots placed as follows:—At the base of the 4th vein; near the middle of the 4th vein, situated so as to be in the middle of both basal cells; at the base of the 2nd vein; on the marginal cross-vein, forming the stigma; and near the tip of the 7th vein. All the cross-veins are narrowly infuscated, as is also the tip of the 2nd vein and base of the 3rd vein. Halteres whitish, clubs black, small.

Length 3 millim.

Described from one female from Kurseong, 5. vii. 08 (*Dr. Annandale*).

Type in the Indian Museum.

The example is a female, and was perfect when identified as a new species, but before being described the apical segments of the abdomen were accidentally lost.

This species must be very near *D. punctulata*, Meij., from Java, and possibly identical with it, as the wing-markings agree pretty closely, so that the only points of difference in the descriptions appear to be the blackish brown antennæ, the short side stripes on the thoracic dorsum, the yellow coxæ, and the yellow base and the ring on each femur, in *D. punctulata*. Meijere's specimen is slightly larger (4 millim.), and a male.

268. **Dicranomyia subfascipennis**, sp. nov. (Pl. VII, fig. 6.)

♂ ♀. *Head* brownish yellow or yellowish grey. Frons narrow, brownish yellow, eyes subcontiguous below, the dividing space grey. Proboscis, palpi and sides of thorax brownish yellow. *Thorax* yellowish, with a slight brownish grey tinge on the dorsum; traces of a median stripe (quite distinct in one specimen) of a slightly brownish colour, narrowly divided for some distance in front. Scutellum, metanotum and sides of thorax concolorous. *Abdomen* brownish yellow, with a little whitish yellow pubescence. Genitalia of male concolorous; an upper and lower rather narrow plate, the lower one with a long narrow prolongation; a pair of large two-jointed claspers, only slightly pubescent. Ovipositor normal, small, concolorous. *Legs* uniformly brownish yellow. *Wings* clear, iridescent. Auxiliary vein ending some little distance beyond base of 2nd vein, which begins beyond middle of wing; marginal cross-vein in middle of marginal cell; præfurca less than half the length of the 2nd vein; basal portion of 3rd vein nearly twice the length of the anterior cross-vein; discal cell twice as long as broad, a little longer than, or equal to, the 2nd and 3rd posterior cells; posterior cross-vein in a line with base of discal cell. Small, very pale brownish yellow infuscations are placed as follows:—Over the base of the 2nd vein; at base of 3rd vein; on marginal cross-vein, and on tips of 6th and 7th veins, with traces of infuscation adventitiously here and there. Halteres brownish yellow.

Length 3 millim.

Described from three males and a female from Kurseong, 4. vii. 08 (*Dr. Annandale*).

Types in the Indian Museum.

269. **Dicranomyia ornatipes**, sp. nov. (Pl. VII, fig. 10.)

♂. *Head* yellowish grey. Proboscis and palpi brownish yellow or pale yellowish. Frons very narrow, eyes contiguous below. Antennal scape yellow, yellowish brown, or bright reddish brown, both joints considerably lengthened; flagellar joints elongate, brownish yellow, the verticel on each joint containing one very long hair, the apical joints being apparently destitute of verticels, or, at least, of the isolated long hairs. *Thorax* yellowish, dorsum mainly brownish grey, the colour more or less in the form of three dusky contiguous stripes of the usual nature, and wholly

dusky behind the suture. Sides and metanotum brownish; scutellum more or less yellow, wholly bright lemon-yellow in one example. *Abdomen* yellowish; the dorsum mainly brownish, except the posterior margins and sides; some pale yellowish hairs at sides. Belly rather lighter. Genitalia yellowish brown, small, concealed, apparently normal. *Legs* pale yellowish; femora with a blackish apical and subapical ring; tarsi blackish towards the tips. *Wings* clear, iridescent. Auxiliary vein opposite origin of 2nd longitudinal vein, which begins at the middle of the wing; 1st longitudinal vein running nearly to the wing-tip, gradually coalescing with the costa, the marginal cross-vein, placed at three-fourths of the marginal cell, meeting the costa at or about the tip of the first longitudinal. In one specimen the marginal cross-vein is absent. Præfurca nearly half the whole length of the 2nd vein; basal portion of 3rd vein equally long as the anterior cross-vein, nearly in a line with it; basal side of discal cell very short, making the cell nearly triangular, half as long as the 2nd and 3rd posterior cells; posterior cross-vein at some little distance before the discal cell; submarginal cell wider at tip than at base, 1st posterior cell narrower at tip than at base. Small infuscations at base and tip of 2nd longitudinal vein, and at base of 5th; stigma pale blackish, the cross-vein faintly but perceptibly infuscated. Halteres pale yellow, clubs blackish.

Length 2½–3 millim.

Described from three males taken by Dr. Annandale in the following localities :—Taikam (coastal region), Travancore, 5.xi. 08 (*type*); Balighai, near Puri, Orissa, 24. x. 08; and Dawna Hills, Lower Burma, 2000–3000 ft., 2–3. iii. 08.

Type in the Indian Museum.

270. **Dicranomyia cinerascens**, sp. nov. (Pl. VII, fig. 11.)

♂ ♀. *Head* yellowish grey; frons similarly coloured, one-fourth the width of the head. Proboscis and palpi moderately dark brown, pubescent. Antennæ dark yellowish brown. *Thorax*: neck rather elongate, black above, yellowish grey below. Dorsum of thorax bright yellowish grey; a dark olive-brown median stripe from anterior margin to suture, and a broader similarly coloured but somewhat paler stripe of irregular width on each side of it, continued beyond the suture in the form of an ill-defined large spot. Sides of thorax, the scutellum and metanotum light yellowish brown. *Abdomen* brown, a little yellowish here and there, with pale pubescence at the sides; emarginations of segments distinct; belly similar. The genital organs of the male consist of an upper and lower plate, a pair of large claspers with a second pair of narrow appendages; in the female, the ovipositor is normal, blackish with yellow tips. *Legs*: coxæ yellowish; femora yellowish at base, the colour quickly darkening to dark brown, the remainder of the legs being also of this colour. *Wings* pale yellowish grey, glabrous, considerably iridescent.

Venation as in *D. fortis.* Stigma rather large, approximately square, ill-defined but distinct, pale brown; the infuscation extending over the base of the 3rd longitudinal vein, and continued weakly along the cross-veins, the distal side of the discal cell and the 5th longitudinal vein. Halteres brown.

Length, ♂ 4½, ♀ 5½ millim.

Described from a male from Darjiling, 8. iv. 10 (*type*), and a female from Kurseong, 24. iii. 10 (*type*), also from four males and one female in my own collection taken by me at Darjiling, 10–20. x. 05.

Types in the Indian Museum.

A good general resemblance to *D. fortis* is noticeable at first sight in this species, but the yellowish grey thorax with at least a distinct dark median stripe, the glassy wings and the dark brown legs will easily distinguish it.

The type female is considerably more strongly built than the male, but the cotype female in my own collection is no larger than the males.

271. **Dicranomyia cinctiventris**, sp. nov.

♀. *Head* blackish grey, antennæ with the first few joints of the flagellum rather wider and shorter, those of the apical half gradually narrowing and lengthening. *Thorax* yellowish brown, a little darker in the centre and just behind the suture, much lighter and more yellowish at the sides. Scutellum and metanotum concolorous. *Abdomen* black; a prominent, moderately broad, well-defined whitish band on hind margin of each segment on the belly. Ovipositor rather short, reddish yellow. *Legs* dark brown; coxæ and base of femora a little yellowish. *Wings* pale grey, vitreous, highly iridescent. Auxiliary vein ending nearly half-way between the origins of the 2nd and 3rd longitudinal veins; discal cell large, approximately quadrate, about equal in length to the 2nd and 3rd posterior cells; anterior cross-vein at inner corner of discal cell, posterior cross-vein immediately before that cell. Halteres blackish.

Length 6 millim.

Described from a unique specimen in the Indian Museum taken at Kurseong, 15. iv. 11 (*Dr. Annandale*).

Very distinct from all other Oriental species by the conspicuous white bands on the belly.

272. **Dicranomyia sordida**, sp. nov.

♂ ♀. *Head* moderately dark grey; frons very narrow, the eyes nearly touching at its narrowest part; back of head similarly coloured, with yellow hairs. Proboscis dark brownish grey, shining; palpi nearly black, a little pubescent. Antennæ with 1st scapal joint grey, 2nd scapal joint and all the flagellar joints brownish yellow; the hairs comparatively short. *Thorax*: neck

and ground-colour yellowish grey; a brownish median stripe, also present on the neck, from the anterior margin to the suture; the postsutural mesonotum darker brownish grey than the rest of the thorax; traces of a dark brownish mark or two on each side of the median stripe. Scutellum lighter brownish grey, hinder edge yellowish; metanotum brownish grey; pleuræ with a slight bluish grey tinge. *Abdomen* brownish, with some pale hairs at the sides; belly similar. (The tip of the abdomen in the male example is broken off.) Ovipositor bright reddish brown. *Legs* uniformly yellowish brown. *Wings* clear. Auxiliary vein opposite base of 2nd vein, which begins distinctly beyond the middle of the wing; marginal cross-vein exactly at middle of marginal cell; præfurca less than half the length of the 2nd vein; basal portion of 3rd vein moderately long, oblique; anterior cross-vein extremely short; discal cell twice as long as broad, oblong, and equal to 2nd and 3rd posterior cells in length; posterior cross-vein almost in a line with base of discal cell. Stigma brown, but small and ill-defined; a trace of a small infuscation at the bases of the 2nd and 4th veins. Halteres narrow and small, whitish yellow.

Length 5 millim.

Described from one male and two females taken as follows:—Type male and a female, Kurseong, 4. ix. 09 and 9. ix. 09 respectively (*Annandale*); type female, Darjiling, 7. viii. 09 (*Paiva*).

Types in the Indian Museum.

273. Dicranomyia delicata, sp. nov.

♂ ♀. *Head*: vertex, back of head, and the narrow frons, yellow, with a few hairs. Proboscis, palpi and antennæ concolorous, the latter very slightly brownish. In the female the whole head more brownish yellow. *Thorax* of male uniformly pale, shining brownish yellow; scutellum, metanotum and sides concolorous. In female, brownish yellow, the dorsum light brownish grey, as are also the metanotum and pleuræ, the scutellum being brownish yellow. *Abdomen* of male yellowish, segments distinctly emarginated; belly similar. Genitalia yellowish; a rather large square plate, bearing a few yellow bristly hairs; below this plate a small greenish grey palp-like organ projects; a pair of robust two-jointed claspers, the 1st joint yellowish, with black hairs, the 2nd more reddish, nearly bare, sponge-like. *Legs* wholly pale yellowish. *Wings* clear, highly iridescent. Venation as in *D. subfascipennis*, except that the auxiliary vein ends just opposite the base of the 2nd vein; that the discal cell is more nearly square than oblong; and that the posterior cross-vein is placed a little before the discal cell. Wing unmarked except for the pale blackish stigma, which suffusion is continued over the base of the 3rd vein; and there is a small slight suffusion on the base of the 2nd vein and on the marginal vein. Halteres pale yellow.

Length, ♂ 3, ♀ 4 millim.

Described from a single male and female taken at Darjiling, the male on 6. viii. 09, the female on 9. viii. 09 (*Paiva*).

Types in the Indian Museum.

Very near *D. subfascipennis*. The nearly clear wings and the slight differences in venation are almost the only specific characters.

274. Dicranomyia flavobrunnea, sp. nov.

♂ ♀. *Head* yellowish grey; frons very narrow; proboscis, palpi and antennæ brownish yellow, normally pubescent. *Thorax* brownish yellow, shining; dorsum with three darker brownish, not always obvious, stripes of the usual pattern, narrowly separated, the median stripe attaining the anterior margin; shoulders rather lighter yellow, at least in the one male specimen; the stripes sometimes hardly visible. Scutellum, metanotum and sides of thorax yellowish. *Abdomen* of male pale yellowish brown, with a little pale pubescence, hind margins and sides of segments narrowly and irregularly pale yellowish. Genitalia brownish yellow, considerably pubescent; consisting of an upper oblong plate, a lower plate with a very narrow chitinous yellow prolongation; and a pair of large claspers with apparently an inner pair of organs. In female, abdomen brown, with a little pale pubescence; ovipositor yellow. *Legs* uniformly brownish yellow. *Wings* pale grey. Auxiliary vein ending just beyond the base of the 2nd longitudinal, which vein begins about the middle of the wing, the præfurca being nearly half the entire length; marginal cross-vein in middle of marginal cell; basal portion of 3rd vein rather long, three times longer than the anterior cross-vein, quitting the 2nd vein nearly at a right angle; discal cell approximately square, about equal in length to the 2nd and 3rd posterior cells; posterior cross-vein in a line with the base of the discal cell. Halteres brownish yellow.

Length 5–6 millim.

Described from one male and five females taken in Calcutta, the type male and female on 18. xi. 07, "at light," the remaining females on 9. vi. 07, 6. xi. 07, and 20. xii. 07.

Types and cotypes in the Indian Museum.

275. Dicranomyia simplex, sp. nov.

♀. *Head* blackish grey; antennæ with elongate oval joints to the flagellum, slightly tinged with brownish yellow. *Thorax* mainly brownish yellow; the usual three dorsal dark stripes, with two behind the suture, ill-defined but dark, giving a uniform dark appearance to the whole of the dorsum. Scutellum and metanotum pale brownish yellow, with traces of a narrow median blackish line on the latter. *Abdomen* dark dirty brown, the hind margins of the segments narrowly pale; belly more or less pale.

Genitalia concolorous, apparently normal. *Legs*: coxæ and some part of the femora towards the base pale dirty yellow; the remainder obscurely brown. *Wings* grey. The auxiliary vein ending a little beyond the origin of the 2nd longitudinal vein; the marginal cross-vein a little beyond the anterior cross-vein; discal cell almost square, nearly as long as 2nd and 3rd posterior cells; posterior cross-vein just before inner end of discal cell. Halteres pale dirty yellow.

Length 5 millm.

Described from one female from Calcutta, 6. xi. 10 (*F. H. Gravely*).

Type in the Indian Museum.

276. **Dicranomyia fortis**, sp. nov.

♂. *Head* dark grey; frons very wide, two-thirds the width of the head at the vertex, narrowing above the antennæ to half this width; eyes contiguous below for a short space. Proboscis dark brown, palpi blackish. Antennæ brownish yellow. *Thorax*: scutellum, metanotum and sides of thorax uniformly bright pale brownish yellow, shining; neck a little blackish above. *Abdomen* brown or brownish yellow, a little lighter on the belly. The 7th and 8th abdominal segments widened. Genitalia peculiarly constructed; a long upper somewhat convex plate, appearing almost as an additional narrow abdominal segment, bearing some strong yellow bristly hairs, tapering to a blunt point, brownish yellow in colour; below this a pair of elongated claspers as long as the upper plate; the elongate-conical 1st joint blackish, shining; the 2nd joint forming a reddish yellow chitinous blade, without terminal hooks or claws; apparently no ventral plate. *Legs* yellowish, femora more or less dark brown or black at tips, often indistinctly so; tips of tarsi blackish. *Wings* pale yellowish grey, considerably iridescent. Venation as in *D. fraterna*, except that the præfurca is nearly half the length of the 2nd longitudinal vein. Stigma pale blackish, sometimes barely perceptible. Halteres yellow, clubs blackish.

Length 4½–5½ millim.

Described from six males in the Indian Museum, five of them (including the type, 6. viii. 09) taken by Mr. Paiva, 6–9. viii. 09, at Darjiling, the others taken at the same place by me, 9. viii. 09.

The peculiar construction of the genitalia ought to make this species tolerably easy of recognition.

277. **Dicranomyia nigrithorax**, sp. nov.

♂. *Head*: eyes wide apart, the frons in one example (in the other the eyes are accidentally compressed) occupying more than half the width of the head; vertex grey, frons whitish with silver reflections. Antennæ 15-jointed; scape dark brown, 1st joint

long and wide, 2nd joint broad, rather large; flagellum dark yellowish brown, basal joints oval, gradually becoming elongated, thirteen in number, with a few long hairs each. Proboscis and palpi blackish brown. *Thorax*: the whole dorsum very dark blackish brown, very shining, with a little minute gold pubescence over the post-sutural depression and on the scutellum and metanotum. The anterior part of the dorsum and the shoulders also bear microscopic gold-grey dust. Sides of thorax brown, shining. *Abdomen* dark brown, more or less shining; posterior margins of segments broadly yellowish. Belly similar; sides of abdomen with a little microscopic gold pubescence. Genitalia dark brown, a little yellowish here and there; an upper plate, ending in two narrow, widely separated palp-like projections; a pair of large claspers, of which the 2nd joint appears confined to a long hook of moderate size; a lower pair of smaller fleshy organs and a very long and narrow ventral plate, the tips yellowish. The whole genitalia moderately pubescent. *Legs* wholly dark brown; distinctly and closely pubescent. *Wings* pale yellowish grey, glassy, highly iridescent. Auxiliary vein ending just perceptibly beyond the base of 2nd longitudinal, of which the præfurca forms nearly half its entire length, the marginal cross-vein placed exactly at its middle, and joined to the tip of the 1st longitudinal; basal section of 3rd vein three to four times as long as anterior cross-vein, which is placed at the corner of the discal cell; this latter being nearly rhomboidal, two-thirds as long as the 2nd and 3rd posterior cells; posterior cross-vein in an exact line with base of discal cell. An apparently *spurious vein*, resembling that of the SYRPHIDÆ, runs in front of the 4th longitudinal vein (in one wing being almost as distinct as a normal vein), turning up at its tip to meet the anterior cross-vein (in the second example this spurious vein is not present). Stigma distinct, of moderate size, pale dirty brown, terminating at marginal cross-vein. Halteres yellow, clubs black.

Length 4½ millim.

Described from two males taken by me at Darjiling, 28. vi. 10 (*type*) and 26. v. 10, the latter specimen having the abdomen missing.

Type in the Indian Museum.

The presence of fifteen joints to the antennæ and the very wide frons rank this species as abnormal. It does not appear as though an antennal joint were missing, in which case the species might be referred to the neighbourhood of *Antocha*. There are no spurs to the tibiæ and it has the appearance of a rather robust *Dicranomyia* with long legs. The presence of the spurious vein is, of course, only adventitious.

Genus GERANOMYIA, *Hal.*

Geranomyia, Haliday, Ent. Month. Mag. i, p. 154 (1833).
Limnobiorhynchus, Westwood, Ann. Soc. Ent. France (1) iv, p. 683 (1835).
Aporosa, Macquart, in Webb and Berth. Hist. Nat. d'Iles Canaries, Entom. Dipt. p. 100 (1838).
Plettusa, Phil., Verh. zool.-bot. Ges. Wien, xv, p. 597 (1865).

GENOTYPE, *Geranomyia unicolor*, Hal.; by original designation.

Head: proboscis conspicuously prolonged, longer than head and thorax together. The mouth parts "consist of a very long subcylindrical epistoma, a still longer lingua, which is slender and pointed, and a labium divided in two branches at the tip, terminated by slender flattened lobes; these branches are divergent and sometimes curled up in dried specimens." (*Osten Sacken.*) The short palpi which, according to Curtis, are biarticulate, are inserted between about the middle of the proboscis and the anterior angles of the rostrum.* Eyes rounded or oval, approximate or divided by a tolerably wide frons. Antennæ 14-jointed, submoniliform, the joints not pedicelled. *Thorax* and *abdomen* normal. Genitalia of the male like that of *Dicranomyia*; two fleshy movable lobes with horny appendages, and a horny ventral plate below them. *Legs* slender; tibiæ without spurs, empodia indistinct or absent, ungues with teeth on underside. *Wings* elongate. One submarginal cell, four posterior cells, and the discal cell normally closed. Venation practically identical with that of *Dicranomyia*, except that the auxiliary vein is generally prolonged some little distance beyond the origin of the 2nd vein, much as in *Limnobia*; the range of variation in the characters of the different veins and cells appears, at least in the Oriental species before me, to be less than in *Dicranomyia*. The auxiliary vein always ends distinctly beyond the origin of the 2nd vein, often as far beyond as half-way from that point to the tip of the 1st longitudinal vein; the subcostal cross-vein placed near its tip, often very difficult to perceive; marginal cross-vein oblique, generally at or beyond the middle of the marginal cell, near or at the tip of 1st longitudinal vein; discal cell pentagonal, squarish or seldom more than twice as long as broad; posterior cross-vein varying from a little before to a little beyond the base of the discal cell.

Range. The genus has been recorded from every region in the globe except Africa, but a species is known from the island of Bourbon, off Mauritius.

Life-history. Apparently unknown but probably similar to that of *Dicranomyia* and *Limnobia*.

Geranomyia is represented in a fossil state by two specimens

* For a splendid plate, giving anatomical particulars of this genus, see Curtis, Brit. Entom. p. 573. Walker, in his Insecta Britannica, Dipt. iii, pl. xxvii, fig. 6, reproduces Curtis's figures of the dissected proboscis.

from the Eocene of Aix seen by Osten Sacken in the Marseilles Museum.

Table of Species.

1	Wings clear	*genitalis*, Brun., p. 388.
	Wings with marks or spots, at least one or two above the stigma	2.
2.	Thorax yellow, with distinct small black spots	3.
	Thorax either yellow, without spots, or dark brown or blackish, with three dorsal stripes present or absent	4.
3.	Thorax with five black spots on dorsum	*flavicosta*, sp. n., p. 389.
	Thorax with a circle of ten small black spots arranged towards the edge of the dorsum	*circipunctata*, sp. n., [p. 390.
4	A large mark like a '3' upside down, on the side of the thorax	*tridens*, sp. n., p. 391.
	No such mark	5.
5.	Wing spots confined to two (over the stigma, or the stigma and præfurca)	6.
	Wing spots more numerous	7.
6.	Two spots over stigma; thorax brownish yellow; wings yellowish	*vinaceobrunnea*, Brun., [p. 392.
	One spot over stigma, one over præfurca; thorax dark brownish black; wings fuscous.	*fletcheri*, Edw., p. 393.
7.	Costa with almost continuous fasciated brown spots, with smaller spots in the remainder of the wing	*pulchripennis*, sp. n., [p. 393.
	Costa with seven distinct brown spots, the apical one very small	8.
8.	The 5th longitudinal vein without a row of small spots	*semistriata*, Brun., [p. 394.
	The 5th longitudinal vein with such a row	*semifasciata*, Brun., [p. 395.

278. Geranomyia genitalis, *Brun.* (Pl. XI, fig. 7.)

Geranomyia genitalis, Brunetti, Rec. Ind. Mus. vi, p. 275 (1911).

♂ ♀. *Head* blackish. Proboscis nearly as long as head and thorax together; palpi placed at the middle, all black. Antennæ black, joints not very distinct. *Thorax* light grey; dorsum mainly occupied by a large shining black spot, projecting broadly forwards to the anterior margin. The linear depression behind the suture wide, light grey, as are also the scutellum and the middle part of the metanotum, the sides of the latter, with the pleuræ, being shining dark brown; sides of thorax light grey. *Abdomen*: dorsum blackish, belly yellowish. Genitalia of male unusually formed; a small square brown upper plate with an underlying pointed piece; a large pair of complicated claspers, the first joint thick, hairy, brownish black, shining; the second of equal or greater length, rather larger, oval, of roughened, sponge-like appearance; the first joint bearing a small concolorous, hairy palp-like organ on the inner side, near the dorsum, below which is a slender yellow semi-transparent hook, and below which again

is a rather small, bifid, interior appendage. The whole organ lightly hairy, except the 2nd joint of the claspers, which is practically bare. In the female the ovipositor is normal, blackish, the terminal blades reddish yellow. *Legs* mainly brown; coxæ, base of femora and basal half of tarsi yellowish. *Wings* pale yellowish grey, conspicuously iridescent; stigma oval, moderate-sized, brown, placed over marginal cross-vein. Auxiliary vein ending nearly half-way between the origin of the 2nd longitudinal vein and the marginal cross-vein; the 2nd vein originating at the middle of the wing, the præfurca two-thirds as long as the remainder; base of 3rd vein three or four times as long as anterior cross-vein; submarginal cell considerably longer than 1st posterior cell; discal cell twice as long as broad, barely shorter than 2nd and 3rd posterior cells; posterior cross-vein immediately after base of discal cell. Halteres blackish brown.

Length 5 millim.

Described from two males (including *type*) from Tenmalai, Western Ghats (western side), Travancore, 21. xi. 08 (*Annandale*); nine males (Pusa coll.) from Nongpoh, Assam, ix. 06; a type female and three other females from the latter locality taken during September also.

Type ♂ in the Indian Museum; ♀ in the Pusa collection.

The conspicuous shining black spot on the light grey thorax, and the unusually constructed male genitalia will render this species easily distinguishable.

279. **Geranomyia flavicosta**, sp. nov. (Pl. VIII, fig. 2; Pl. XI, fig. 6.)

♀. *Head* missing, except a very small portion of the neck, and the whole proboscis, which is yellow, with a black ring at the tip. *Thorax* bright brownish yellow; two less distinct brown spots in front of the shoulders, and, situated on the dorsum, are five very large and distinct dark brown, approximately oval spots, placed thus:—one behind each shoulder, one in the centre of the dorsum, and one on each side behind the suture. Sides, scutellum, and metanotum yellow. *Abdomen* missing, but writing from memory, it was wholly yellowish, concolorous with most of the rest of the body. *Legs* pale yellow; extreme tips of femora, tibiæ and tarsi black. *Wings* nearly clear; costal cell bright yellow, the colour extending to the tip of the wing on the costal vein itself; five black spots (the first three elongated) along the costa, the fourth situated at the tip of the 1st vein, and the fifth at the tip of the 2nd vein. The præfurca narrowly suffused with dark brown, the colour continuing along all the veins to the tip of the 5th vein, which latter vein is itself narrowly suffused along its entire length; tips of 6th and 7th veins narrowly suffused; a pale brown streak of moderate width from the 1st posterior cell along the outer side of the discal cell, to the hind margin of wing.

Length (from memory) about 5 millim.

Described from an incomplete example taken by Dr. J. T. Jenkins on board a launch "at light," at Chandpal, Ganges delta, 26. viii. 09.

Type in the Indian Museum.

As a rule I do not care to describe a species from a single incomplete specimen, but in the present case the very conspicuous markings on both the thorax and the wing render the identification of the species very easy.

280. **Geranomyia circipunctata**, sp. nov. (Pl. VIII, fig. 3; Pl. XI, fig. 3.)

♂ ♀. *Head*: occiput and head generally yellowish, the former sometimes with a few blackish spots. Proboscis a little brownish, comparatively short, being about one-and-a-half times as long as the head and neck together, distinctly stout and snout-like at the base, tapering gradually; the basal half with numerous long hairs. Palpi inserted at the middle of the proboscis, quite short, black, two-jointed. Antennæ yellow, flagellum with the basal joints sometimes brownish; the joints nearly oval, close together, each with a circlet of four comparatively short individual hairs, apart from the microscopic pubescence; in some specimens the scape is brownish also. Eyes separated by a rather wide yellow frons. Neck bearing a few long hairs. *Thorax* rather bright shining yellow, with the least tinge of brown; dorsum with a circle of conspicuous black or brown spots, the spots approximately oval and arranged as follows:—one on each side of the centre near the anterior margin, placed longitudinally; three lateral ones on each side, rather larger and placed transversely, two being in front of and one behind the suture, this hinder one being more or less triangular; on the mesonotum behind the suture is, on each side of the middle, a brown longitudinal spot almost in the nature of a streak, its edges being less well-defined than in the other spots. Scutellum normally yellow, in some examples more or less blackish; metanotum yellow with two brownish marks, or wholly brownish. *Abdomen* of male varying from yellowish to yellowish brown, with a row of small black spots on each side, these being sometimes indistinct or absent; in some examples there are two black stripes extending the length of the last two segments. In female, lighter or darker chestnut-brown, belly similar, the side-spots less obvious. Genitalia concolorous in male, formed of a pair of conspicuous, fleshy, two-jointed hairy claspers, with two or three pairs of appendages, including a strong black hook or claw attached apparently to the inner side of each clasper at the end of the first joint; a ventral plate is present. In the female the ovipositor normal, yellowish. *Legs* pale yellow, extreme tips of femora, tibiæ and tarsi blackish. *Wings* very pale yellowish grey, with very small but distinct blackish infuscations distributed as follows:—at the base of the præfurca; on the 1st longitudinal vein, a little anterior to the previous spot; at tip of 1st vein: at

base of 5th vein, with a less distinct one just above this latter spot. The cross-veins show a tendency to just perceptible suffusion. Halteres yellowish.

Length 4½–6 millim.

Described from several of both sexes in the Indian Museum, which demonstrate its apparent general distribution in Lower Bengal, the series comprising specimens from Sonarpur, near Calcutta, 5. ii. 10, "at light" in a railway carriage, taken by Dr. Annandale (*type* ♂); Sorabkatti, 7. xii. 09 (*type* ♀) and 14. xii. 09; Bosondhur, 21. viii. 09; Chennia, 11. xi. 09; Sonadigee, 6. xii. 09; and Bologhatta, 23. viii. 09, all these places being in the Ganges delta, the specimens having been taken "at light" on board a launch by Dr. J. T. Jenkins. Other examples in the Museum collection are from Port Canning, 6. xii. 07; Calcutta, 18. ix. 07; on board ship 10 miles off Masulipatam, Madras Coast, 4–5. iv. 08 (*Paiva*); and Puri, Orissa Coast, 12. xi. 10, in house (*Annandale*).

Types in the Indian Museum.

The very conspicuous circle of spots on the thorax, together with the very delicately punctated wings, render this species very distinct even in the whole family of TIPULIDÆ.

281. **Geranomyia tridens**, sp. nov. (Pl. VIII, fig. 4; Pl. XI, figs. 4, 5.)

♂ ♀. *Head*: occiput dark grey, with a few isolated rather conspicuous bristly hairs; back of head yellow; neck brownish yellow, with a small dark transverse streak about the middle; eyes nearly contiguous. Antennæ dark brown; in male, the joints distinctly separated, elongated pear-shaped, the narrow apical part much attenuated, each joint with a circlet of four long bristles in addition to the ordinary short pubescence; in female, the joints much less distinct, scape broad, 1st joint sometimes with a transverse suture near base making it appear like two joints; flagellum with light grey pubescence. Proboscis of considerable length, as long as from the base of the antennæ to the halteres, stout at the base only, brownish yellow or yellow, with a few long hairs on the basal half and very minute ones on the thin apical half; the small, brown two-jointed palpi situated at the tip of the basal part. *Thorax* yellowish, with very distinctive and conspicuous markings; dorsum with a broad brown median stripe from anterior margin to the suture, somewhat indistinct about its middle: practically the whole of the dorsum behind the suture occupied by two very large dark brown shining spots divided by the usual wide yellowish depression; on each shoulder a very dark blackish-brown moderate-sized spot, and posterior to this a large trident-shaped blackish-brown spot, the three prongs (approximately parallel) pointing backwards, the spot occupying the whole of the side of the thorax up to the wing-base. Sides of thorax yellowish; pluræ moderately shining brown; scutellum and metanotum shining dark brown,

except for a narrow yellow part at the base of each. *Abdomen* variable, considerably pubescent. In male normally dark brown, the posterior margins pale yellowish, this colour being variable in extent and intensity; in one male the whole abdomen is practically yellowish, with a lateral brown stripe on each side of the dorsum. The abdomen in the female is generally still darker brown, roughened, the pale marginal bands very narrow or absent. Genitalia in both sexes brownish yellow. In the male the organs are complex and conspicuous, consisting of a large pair of claspers rather thickly covered with bristly hairs, with smaller inner organs attached; an upper small plate in the shape of two pointed pieces, side by side, terminating in two sharp points; and a very narrow ventral plate curved downwards at its tip. *Legs* light brownish yellow; extreme tips of femora, tibiæ and tarsi sometimes blackish. *Wings* pale grey; a pale blackish spot on the costa just beyond the humeral cross-vein, one just above the origin of the 2nd longitudinal vein and extending to it, also an intermediate one between these two spots; another spot over the tip of the marginal cross-vein extending downwards to the base of the 3rd vein; a similar spot at the tip of the 1st vein. All the cross-veins, with the tips of the 5th and 7th veins, faintly, narrowly, but distinctly suffused. Halteres brownish yellow.

Length 5–6 millim.

Described from two males and four females in the Indian Museum, taken by Dr. J. T. Jenkins on board a launch, "at light," in the Sunderbuns, Ganges delta; the type ♂ from Sonadigee, Sunderbuns, 6. xii. 09, and the type ♀ from Chennia, Sunderbuns, 11. xi. 09.

282. Geranomyia vinaceobrunnea, *Brun.*

Geranomyia vinaceobrunnea, Brunetti, Rec. Ind. Mus. vi, p. 274 (1911).

♀. *Head* dark grey; frons narrow, narrower on vertex, whitish grey. Proboscis black, a little longer than head and thorax together. Antennal scape yellowish, except tip of joint which is, with the flagellum, dark brown. *Thorax* mainly brownish yellow, with three dorsal claret-brown stripes, the outer ones short and quite united with the median one, which is moderately wide, attaining the anterior margin, and continuing narrowly on the brownish yellow neck; dorsum behind suture claret-brown. Scutellum yellow; metanotum grey; sides of thorax yellowish, with light claret-coloured reflections just below the dorsum. *Abdomen* dark brown, with a few pale hairs; posterior margins of segments pale yellowish. Belly yellowish; ovipositor brownish yellow. *Legs*: coxæ brownish yellow, with a trace of claret-coloured reflections; remainder of legs yellowish, tips of femora scarcely darker. *Wings* pale yellowish grey, glassy, iridescent. Auxiliary vein ending nearly half-way between the base of the

2nd longitudinal and the marginal cross-vein, which latter is placed exactly at the tip of the 1st longitudinal, and just beyond the middle of the marginal cell; base of 3rd vein oblique, two and a half times the length of the anterior cross-vein; discal cell twice as long as broad, as long as the 2nd and 3rd posterior cells; posterior cross-vein barely beyond base of discal cell; veins on distal part of wing practically parallel. Stigma light brown, ill defined but distinct, situated over the marginal cross-vein. Halteres brownish yellow.

Described from one female taken by Mr. Howlett at Simla, x. 08.

Type in the Pusa collection.

283. Geranomyia fletcheri, *Edw.*

Geranomyia fletcheri, Edwards, Ann. Mag. Nat. Hist. (8) viii, p. 60 (July 1911).

♀. "Fusca, alis unicoloris subfuscis, rostro thorace vix longiore.

Head, including rostrum and antennæ, dark brownish black. Antennal joints cylindrical, one and a half times as long as broad. Rostrum slightly longer than thorax; palpi apparently two-jointed, placed just before middle of rostrum. *Thorax* dark brownish black, with a small ochreous-brown spot on each side of the front margin of the mesonotum, and another above and behind the insertion of the wings. *Abdomen* dark fuscous. *Legs* dark brown, coxæ ochreous brown, femora somewhat lighter towards base. *Wings* uniformly fuscous-tinged, unspotted except for the stigma and a faint brown cloud at the base of the præfurca. Mediastinal vein reaching costa considerably beyond origin of præfurca, subcostal cross-vein near its tip. Marginal cross-vein nearly three times as long as the upturned tip of the 1st longitudinal, with which it is nearly in a line. Second posterior cell with a rectangular base, third longer than second, its upper margin rounded towards the base. Great cross-vein at or just before the base of the discal cell. Halteres with the knob brown, the stem ochreous." (*Edwards.*)

Length 5 millim. (excluding rostrum), of wing 6 millim.

Described from a type and two other females taken by Mr. Bainbrigge Fletcher at Madulsima, Ceylon, 19. v. 08 (*type*) and 21. xii. 07.

Type in the British Museum.

284. Geranomyia pulchripennis, sp. nov. (Pl. VIII, fig. 1.)

♀. *Head*: eyes nearly contiguous; the narrow frons light grey with pale hairs; back of head yellowish, with grey reflections and black hairs. Proboscis black, as long as the abdomen (exclusive of ovipositor); palpi black. Scapal joints of antennæ large, the 2nd much narrower and shorter; dark brown; flagellum dark

brown, with a little pale pubescence. *Thorax* brownish yellow; three reddish brown stripes, all reaching from the anterior to the posterior margin, the median one a little broader than the others. Shoulders depressed. Sides of thorax yellow, a median transverse brown line; a blackish indistinct mark with whitish dust in front of wing-base. Scutellum very small, yellow; metanotum yellowish, broadly brown on each side. *Abdomen* dark dirty yellowish brown; emarginations of segments very distinct, as each segment is apparently slightly narrower at the base. Belly similar. Ovipositor brownish yellow, paler at tip. *Legs* uniformly pale yellow, barely, if at all, darker at tips of tarsi. *Wings* nearly clear, marked with brown spots; two larger ones, more or less square in shape, on basal half of costa, extending from costal margin to the 4th longitudinal vein; two somewhat large elongated ones placed close together on the costa, exactly in the middle of the wing, and joined posteriorly at about the origin of the 2nd vein; two large ones placed together at the distal extremity of the costa, reaching posteriorly as far as the 3rd vein, where they are united; a small clear spot in the distal one of this pair of spots is placed just above the tip of the 3rd vein. Smaller spots of the same colour are placed as follows:—two on the basal part of the costa, one situated anterior to each of the two larger costal marks; a round spot at the bifurcation of the 2nd vein; a row of indistinct small ones along the upperside of the 5th vein; around the inner and outer sides of the discal cell; and around the posterior cross-vein, which is placed distinctly anterior to the discal cell; also at the tip of the 7th vein. Very small indistinct spots are apparently irregularly placed here and there, especially towards the posterior apical part of the wing. Costal cell yellow except where the brown spots occur. Halteres brownish.

Length 4 millim.

Described from a single female from Kurseong, 7.ix.09 (*Annandale*).

Type in the Indian Museum.

285. **Geranomyia semistriata**, *Brun.* (Pl. VII, fig. 17.)

Geranomyia semistriata, Brunetti, Rec. Ind. Mus. vi, p. 277 (1911).

♀. *Head* dark grey, frons narrow; back of head and neck blackish grey. Proboscis black, distinctly longer than head and thorax together; palpi black, inserted before the middle of the proboscis. Antennæ brownish yellow, sometimes darker. *Thorax*: dorsum brownish or light grey, dusted with grey; three narrow reddish brown stripes: the median one from the anterior margin to about the middle of the dorsum; the outer ones beginning behind the shoulders and carried over the suture without interruption to the posterior margin; an additional narrow intermediate stripe between them commencing behind the suture and continued

to the base of the scutellum; a short narrow stripe on each side above and in front of the wing root. Prothorax brownish yellow in one specimen, edge of dorsum and sides of thorax (in type specimen) light grey; pleuræ yellowish, with some grey reflections. Scutellum and metanotum concolorous with dorsum of thorax, edge of former brownish yellow. *Abdomen* dark claret-brown, roughened; belly yellowish; ovipositor large, robust, black, barely shining, terminal blades reddish yellow. *Legs*: coxæ and femora brownish yellow, tips of femora slightly thickened and blackish; tibiæ and tarsi brown. *Wings* pale grey, with seven moderately dark brown spots on the costa placed approximately equidistantly; the third enclosing the origin of the 2nd longitudinal vein; these first three spots extending posteriorly barely to the 4th longitudinal vein; the fourth spot terminates over the fork of the 2nd vein; the fifth (the largest, enclosing the marginal cross-vein) extends posteriorly to the 3rd vein; the seventh is very small, triangular, placed at the extreme tip of the 3rd vein. A narrow brown irregular line encloses the anterior and posterior cross-veins, with the basal side of the discal cell, and there is a small suffusion over the proximal side of the discal cell. The venation is normal; basal part of 3rd longitudinal vein long, the remainder of the vein, parallel to the 2nd; anterior cross-vein short; discal cell twice as long as wide; posterior cross-vein distinctly but not greatly before the base of the discal cell. The 5th and 7th veins very narrowly suffused with brown. Halteres: stem pale yellow, knobs blackish brown.

Length nearly 5 millim.

Described from two females from Paresnath, Western Bengal, 4300–4500 ft., 15. iv. 09 (*Annandale*).

Type and cotype in the Indian Museum.

286. **Geranomyia semifasciata**, *Brun.* (Pl. VII, fig. 16.)

Geranomyia semifasciata, Brunetti, Rec. Ind. Mus. vi, p. 276 (1911).

♀. *Head* light grey; frons very narrow; proboscis black, as long as head and thorax together; antennæ brownish yellow, flagellum darker than scape. *Thorax*: neck yellowish, a dorsal distinct dark brown stripe and a lateral less distinct one on each side. Dorsum of thorax yellowish, with a brownish tinge; three very narrow, ill-defined, but obvious, reddish brown stripes, well separated; the median one barely reaching the anterior margin; behind the suture the space wholly occupied, except the wide greyish post-sutural depression, by two large brownish spots, the colour gradually merging in that of the sides; sides of dorsum with whitish reflections. Sides of thorax yellow; scutellum and metanotum brownish. *Abdomen* brownish yellow, posterior border of each segment blackish, the colour extending along the sides more or less; ovipositor yellowish. *Legs* pale yellowish, tips of

femora a little blackish. *Wings* pale yellowish grey. Auxiliary vein ending mid-way between the base of the 2nd vein and the tip of the 1st; the 2nd beginning at the middle of the wing; the præfurca nearly as long as the rest of the vein, which is a little sinuous and curved upwards at tip; marginal cross-vein placed distinctly beyond the middle of the marginal cell; base of 3rd vein two and a half times as long as anterior cross-vein; discal cell much broader distally, a little longer than double its average width, and a little longer than the 2nd and 3rd posterior cells; posterior cross-vein in a line with the base of the discal cell, the anterior cross-vein in the same straight line. The markings of the wing are brown in colour, and are placed as follows:—three narrow streaks begin (anterior to the middle of the wing) on the costa, and extend posteriorly nearly to the middle of the wing, the first streak nearly basal; a fourth narrow costal streak begins at the tip of the auxiliary vein and extends to the base of the 3rd vein; the next costal streak (the widest of all) is over the marginal cross-vein, and is clear cut, being suddenly reduced to half its width at the 2nd longitudinal vein, beyond which it is continued, terminating abruptly at the 3rd vein; the two remaining costal marks are a conical (reversed) and a triangular spot, both touching the 3rd vein; the anterior cross-vein, the inner side of the discal cell, and the posterior cross-vein bear a small spot each, these spots being practically contiguous; the distal side of the discal cell is suffused with brown and the 1st posterior cell contains two lighter spots, the 2nd posterior cell containing one; the 2nd basal cell has three small spots; the tip of the 7th vein is suffused. Halteres brownish yellow, clubs black.

Length $5\frac{1}{4}$ millim.

Described from a single specimen taken by Mr. F. M. Howlett at Darjiling, 3–9. vi. 09.

Type in the Pusa collection.

Genus **LIMNOBIA**, *Mg.*

Limnobia, Meigen, Syst. Besch. i, p. 116 (1818).
Limonia, Meigen, Illig. Magaz. ii, p. 262 (1803) (*nom. sine sp.*).
Numantia, Bigot, Ann. Soc. Ent. France (3), ii, p. 470 (1854).
Limnomyza, Rondani, Prod. Ital. Dipt. i. p. 185 (1856).

GENOTYPE: *Tipula tripunctata*, F.; according to, but not designated by, Coquillett (1910).

Head much as in *Dicranomyia*. Proboscis and palpi rather larger and stouter. Antennæ of fourteen joints, which sometimes appear as if fifteen in number, as the last joint often possesses a cylindrical prolongation, sometimes slightly clavate at the tip, which, even in living examples, looks like an additional joint. The individual joints of the antennæ are generally more elongate than in *Dicranomyia*, especially towards the tip, and the verticels

of hair are longer. *Thorax* and *abdomen* practically as in *Dicranomyia*, although generally rather more robust in most of the species. Genitalia of male with a large fleshy 1st joint, the 2nd formed of a large horny hook; intermediate additional organs are sometimes present; a ventral plate. Ovipositor of female much like that of *Dicranomyia* (*vide ante*). *Legs* stouter than in *Dicranomyia*, but sometimes of great length; tibiæ without terminal spurs, empodia indistinct or absent, ungues with several teeth below, giving them a pectinate appearance. *Wings* generally shorter and broader than in *Dicranomyia*; one submarginal cell, four posterior cells, discal cell always closed.*

Auxiliary vein ending some distance beyond origin of 2nd vein; † the marginal cross-vein, generally falling very near the middle of the marginal cell, is placed at the tip of the 1st longitudinal vein or a little way before it, generally surrounded by the stigma. In some species the appearance of the 1st vein gives the impression that it turns down at the tip into the 2nd vein, with a cross-vein between it and the costa, but in such cases the vein must be considered to pursue its normal course, connected as usual with the 2nd longitudinal by the normal marginal cross-vein; the same appearance occurs not infrequently in species of *Dicranomyia* (as noted under that genus). In general the venation in *Limnobia* is more uniformly consistent than in *Dicranomyia*; the basal section of the 3rd vein is more nearly of a uniform length ‡; the discal cell is shorter than in *Dicranomyia*, more often approaching a square shape with one corner cut off; the position of the posterior cross-vein varies from distinctly before the base of the discal cell (in *festiva*) to almost at its middle (*longinervis*).

Range. World-wide, nearly two hundred species being known.

The chief characteristics which distinguish *Limnobia* from *Dicranomyia* are: (1) its generally more robust nature, larger size, and brighter colouring; (2) the position of the tip of the auxiliary vein, which ends much further distally than in *Dicranomyia*, in which it ends approximately opposite the origin of the 2nd vein; and (3) the different structure of the male genital organs, this latter character being naturally the most difficult one to observe in dried insects.

Many of the species are of considerable size, some having legs of great length, as in the European species *L. bifasciata*, Schrk.,

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* Personally, I have seen no species with an open discal cell, even in an accidental case, and Osten Sacken notes the same fact, yet of course it may occur sometimes adventitiously, if not specifically.

† The only exception among the Oriental species is *festiva*, Brun., in which it ends opposite the origin of the 2nd vein, but the whole appearance of the species is so *Limnobia*-like that it is, at least provisionally, placed in this genus. The next nearest species of this nature is *tinctinervis*, Brun., in which the auxiliary vein ends at the middle of the præfurca.

‡ At least in all the Oriental species, and such European ones as are available for comparison.

and *quadrinotata*, Mg. The markings of the body are more pronounced and conspicuous than in *Dicranomyia*, the species being generally yellow with black stripes, with bands and spots on the body, and often black rings on the legs, the wings being more brightly ornamented in those species possessing wing markings, though many species have quite clear wings. The colours in *Dicranomyia* are more obscure: greys, browns, blackish browns and more or less sombre colours generally predominating, and the wings in this genus, though often ornamented prettily, have these patterns of a more delicate and less conspicuous nature.

Osten Sacken divided the genus *Limnobia* tentatively into two groups, to which he refrained from giving names as they were not of sufficient taxonomic value to be regarded as more than convenient subdivisions to facilitate recognition of species. It is not certain whether these groups are still sufficiently clearly differentiated, if the species of the whole world be considered, and in any case there are certainly intermediate species, even among the Oriental ones.

The larger and more typical species of *Limnobia*, generally including most of the brightly coloured ones, as a rule have the marginal cross-vein near the tip of the 1st longitudinal vein.* The ovipositor in the females of this group is shorter, more curved, and much like that of *Dicranomyia*. Amongst the Oriental species *trimaculata*, *indica* and *festiva* belong here.

The second group have the marginal cross-vein at some little distance before the tip of the 1st longitudinal, and more or less obscured by the stigma. The female ovipositor in this group is longer, more slender and more pointed than in the first group.†

The venation, as previously observed, is much more consistent than in *Dicranomyia*, only *L. festiva*, Brun., departing from the generic character in having the tip of the auxiliary vein opposite or barely beyond the origin of the 2nd longitudinal vein. In a second species—*tinctinervis*, Brun.—the auxiliary vein ends opposite the middle of the præfurca; in all other species it ends more distally than in these two. In *longinervis*, Brun., all the veins in the distal part of the wing are much lengthened, the submarginal cell and the 1st posterior cell beginning in the middle of the wing. All the other Oriental species depart very little from the typical venation.

Life-history. The larva of *Limnobia* usually lives in decaying vegetable matter, especially in rotten wood and fungi. Stannius found the larva of *L. bifasciata*, Schrk. (better known, perhaps, as *xanthoptera*, Mg.), in an *Agaricus*. It was wrapped in a sheath of earthy matter, rough on the outside, smooth and shining on the

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* The European species *L. annulus*, Mg., *quadrinotata*, Mg., and *bifasciata*, Schrk. (*xanthoptera*, Mg.), belong to this first group, as do also the North American species *cinctipes*, Say, *solitaria*, Os. Sac., and *triocellata*, Os. Sac.

† Amongst European species *L. flavipes*, Mg., *nubeculosa*, Mg., *sylvicola*, Schum., and *nigropunctata*, Schum., belong here.

inside, and it passed its transformations underground. Van Roser found the larva of *L. annulus* in decaying wood; it resembled an earthworm in size as well as colour, and lined its burrows with a kind of silken web.

The imagos occur almost anywhere, many species being found occasionally in houses, though they prefer shaded spots in woods.

Limnobia, as originally constituted by Meigen in 1818, included all the LIMNOBIINÆ, with the exception of *Erioptera*, *Anisomera*, *Trichocera* and *Rhipidia*. Macquart then reduced it to species with four posterior cells. Stephens in 1829 cut off a number of species which he formed into the genus *Dicranomyia*, although, subsequently to the creation of this genus, Zetterstedt, Walker and others still retained *Limnobia* in Meigen's wide acceptation. Osten Sacken in 1859 restricted the genus to that section which he afterwards designated the LIMNOBINA. In 1869, in his classic monograph of the North American species, he admits *Limnobia*, *Dicranomyia*, *Geranomyia*, *Rhipidia* and *Trochobola* as good genera.

Table of Species.

1. Auxiliary vein ending opposite the origin of the 2nd longitudinal vein; wing maculated	*festiva*, sp. n., p. 400.
Auxiliary vein ending distinctly beyond the origin of the 2nd longitudinal vein: wing marked or clear	2.
2. Wing with distinct spots in addition to the suffusion around the stigma	3.
Wing clear, or with at most the stigma darkened	6.
3. Posterior cross-vein before the inner side of the discal cell	*tinctinervis*, sp. n., p. 401.
Posterior cross-vein in a line with the inner side of the discal cell or a little more distal	4.
4. Costa with three very distinct dark brown spots, the wing being also otherwise marked, or at least the cross-veins suffused	5.
Costa unspotted, the only wing-marks being the stigma and one over the base of the 2nd longitudinal vein	*indica*, sp. n., p. 401.
5. Yellow species; very distinct brown spots at base, at base of 2nd vein, at tip of 1st vein, at tip of wing and tip of 7th vein; most of the veins slightly suffused	*trimaculata*, sp. n., p. 402.
Brown species; three dull but distinct brown spots on costa, closer together; also at the base of the 2nd vein, tip of auxiliary vein and tip of 1st vein; cross-veins lightly suffused	*longinervis*, sp. n., p. 403.

6. Wing with stigma blackish	7.
Wing wholly clear; posterior cross-vein situated at middle of discal cell .	*centralis*, sp. n., p. 403.
7. Tarsi, except metatarsi, snow-white ..	*nivcipes*, sp. n., p. 404.
Tarsi never snow-white	8.
8. Discal cell nearly as long as the 2nd or 3rd posterior cell	9.
Discal cell only half as long as the 2nd or 3rd posterior cell	*nigra*, sp. n., p. 404.
9. The 3rd posterior cell approximately oblong; wing more or less vitreous; sides of abdomen with a row of whitish spots	*vitripennis*, sp. n., p. 405.
The 3rd posterior cell triangular; wing clear; sides of abdomen without white spots	*triangularis*, sp. n., p. 406.

287. **Limnobia festiva**, sp. nov. (Pl. VII, fig. 13.)

♂. *Head* mainly dark grey, lighter on frons; eyes nearly contiguous for a short space only; proboscis and palpi blackish; antennal scape black, flagellum blackish; neck rather robust, yellow, dorsum and sides black. *Thorax* mainly bright chrome-yellow, lighter yellow on sides; a dark brown median stripe from the neck to the scutellum, where it enlarges somewhat and fades away; behind the suture two large, brown, slightly shining spots. Scutellum shining brownish, with grey reflections; metanotum with a broad concolorous median brown stripe. *Abdomen* yellowish, a little soft pubescence at the sides; posterior margins of segments distinctly blackish and the dorsum of each segment is a little blackish here and there. Belly yellowish, blackish towards apical half, margins of segments with well-defined border. Genitalia brown, with a few black hairs, apparently consisting of a pair of moderate-sized claspers and one or two pairs of smaller organs. *Legs* dark brown; femora broadly black at tips, with a moderately wide subapical yellowish ring. *Wings* yellowish. Auxiliary vein ending opposite the origin of the 2nd longitudinal vein, as in *Dicranomyia*; the 2nd longitudinal vein originating distinctly beyond the middle of the wing; marginal cross-vein distinctly before tip of 1st vein; præfurca half as long as remainder of 2nd vein; base of 3rd vein fully twice as long as anterior cross-vein; discal cell distinctly longer than broad, nearly oblong, slightly wider distally than at base, distinctly shorter than 2nd and 3rd posterior cells; posterior cross-vein distinctly before base of discal cell. A dark brown spot over the stigma, the præfurca darkened also, the colour of both spots united with one over the fork of the 2nd vein. The following lighter brownish grey suffusions:—a square spot in the middle of the very broad anterior basal cell, which is more faintly duplicated in the posterior basal cell; the tip of the wing from the tip of the 2nd vein to the 3rd posterior cell, inclusive. Wings highly glassy and iridescent. Halteres blackish.

Length 7 millim.

Described from a single male from Kurseong, taken in June, 1910.

Type in the Indian Museum.

Although the auxiliary vein ends opposite the base of the 2nd vein as in *Dicranomyia*, there can be no doubt that this species is better placed in *Limnobia*, from its robustness, broader wings, and stouter legs. It has every appearance of the more compact bright yellow and black species of *Limnobia* found in Europe.

288. **Limnobia tinctinervis**, sp. nov. (Pl. VII, fig. 12.)

♀. *Head* blackish grey, back of head with some long hairs. Antennal scape and 1st flagellar joint blackish, remainder brownish yellow with whitish grey pubescence. Proboscis brownish yellow; palpi blackish. *Thorax* rather bright yellow; two narrow median brown stripes joined by an intermediate dark grey stripe; these stripes reaching from the anterior margin to the suture only. Scutellum pale yellow; metanotum brownish yellow, with a brown dorsal mark or stripe; sides of thorax yellowish. *Abdomen* brownish yellow, with a little light pubescence; posterior margins of segments dark brown. Genitalia normal, brownish yellow. *Legs* uniformly brownish yellow; femora rather incrassated at tips, where they are slightly blackish. *Wings* nearly clear. Auxiliary vein ending at one-third of the distance between the origin of the 2nd vein and the tip of the 1st. Veins yellow, except where they are narrowly and shortly suffused with black. These suffusions are placed thus:—a rather long space beyond the base of the costal cell; the costal vein and 1st vein shortly, just above the base of the 2nd vein, which is also similarly darkened; a blackish square spot over the tip of the 1st longitudinal vein enclosing the marginal cross-vein; both cross-veins; the two veinlets forming the distal side of the discal cell; fork of the 2nd vein; origin of 3rd vein; tips of all the branches of the 4th vein, with the tips of the 5th, 6th and 7th veins. Halteres yellowish.

Length 3½ millim.

Described from one specimen, Darjiling, 10. viii. 09 (*Paiva*).

Type in the Indian Museum.

289. **Limnobia indica**, sp. nov. (Pl. VII, fig. 15; Pl. XI, fig. 1.)

♂ ♀. *Head* mainly dark brown; antennæ pale yellow. *Thorax*: neck dark brown, with some stiff hairs. Dorsum yellowish, rather brighter in front of the suture, from which to the anterior border runs a narrow blackish stripe; sides of thorax pale yellow, almost livid. Scutellum and upper part of metanotum with a blackish tinge. *Abdomen* yellowish, with the dorsum more or less occupied by a broad blackish stripe, which in the female sometimes fills the whole surface; on the last two segments there is on each one a blackish mark on each side, towards the side margins.

Genitalia of male consisting mainly of a very large pair of hairy yellow fleshy bifid claspers, surmounted by a pair of small black-tipped hooks; a small palp-like organ emerges from below the ultimate segment of the abdomen; these organs are not enclosed by any protecting plates or sheaths. In the female the ovipositor consists of a rather larger upper conical piece, ending in two comparatively small sheaths, and below this a pair of shorter smaller organs, which also terminate in a pair of hard chitinous sheaths; the upper piece bears a pair of peculiarly curved bristles directed backwards. *Legs* dark brown, basal part of femora pale, and also broadly pale beyond the middle, leaving a moderately wide black ring at tip. *Wings* nearly clear; a brownish square stigma at tip of 1st longitudinal vein; base of præfurca very slightly suffused; veins black. Halteres with the stem pale, considerably pubescent; knob black, bare.

Length 5 millim.

Described from several specimens in the Indian Museum from Calcutta (September to February), where it is not uncommon, and Katihar, Bengal, 7–31. viii. 10. I have seen it from Madhupur, Bengal, 13. x. 09 (*Paiva*), and it is in the Pusa collection from Pusa, 18–20. ii. 08 (on moss) and ix. 07.

Types in the Indian Museum.

290. **Limnobia trimaculata**, sp. nov. (Pl. VII, fig. 16.)

♂ ♀. *Head* entirely blackish, back of head dark grey; antennal scape black, flagellum pale yellow. *Thorax*: dorsum yellowish white, with a broad brown median stripe from the anterior margin, widening posteriorly until it reaches the suture, behind which are two large oval brown spots which reach the scutellum; sides of thorax yellowish white. Scutellum and metanotum brown, the former with a narrow pale median line. *Abdomen* yellowish; dorsum of each segment wholly dark brown, posterior border of segments in female narrowly pale. Genitalia of male pale yellow; in the female the ovipositor is reddish yellow, with two shining small black spots on the lower side. *Legs* pale yellow; femora and tibiæ with brown tips; tarsi brownish. *Wings* nearly clear, veins brown; three distinct, but not large, round brown spots situated as follows:—the 1st at the base of the marginal cells, the 2nd on the origin of the præfurca, the 3rd at the tip of the 1st longitudinal vein. Extreme tip of wing pale brown, cross-veins a little infuscated, as is also the tip of the 7th vein; a tendency to slight infuscation at the tips of some of the other veins. Halteres pale yellow, knobs blackish brown.

Length $6\frac{1}{2}$–$7\frac{1}{2}$ millim.

Described from several examples in the Indian Museum taken at Kurseong by Dr. Annandale, 3–5. vii. 08 and 18–29. vi. 09, when he found it common amongst ferns and low herbage, often entering houses at night, attracted by a light.

291. **Limnobia longinervis**, sp. nov. (Pl. VII, fig. 14.)

♀. *Head*: eyes nearly contiguous; back of head on upper half brown, on lower half blackish grey. Proboscis brownish yellow; palpi blackish. Antennal scape dark grey, flagellum blackish. *Thorax* brownish yellow; centre of dorsum occupied by two contiguous concolorous stripes from anterior margin to suture. Scutellum, metanotum, and sides of thorax concolorous, with lighter reflections here and there. *Abdomen* brownish yellow, the major part of the dorsum of each segment dark brown; pubescence very short. Belly mainly yellowish, with indistinct blackish marks. Ovipositor compact, robust, apparently more complex than usual, terminal blades short. *Legs* brownish yellow; femora becoming rather darker towards the tips, but the tips themselves broadly of the prevailing paler colour. *Wings* grey. Auxiliary vein ending half-way between the origin of the 2nd longitudinal vein and the tip of the 1st; the 2nd vein originating some distance before the middle of the wing, the præfurca rather short; the 3rd vein beginning just beyond the tip of the præfurca; the anterior cross-vein in a line with the basal side of the discal cell, which is about twice as long as broad; all the fine veins running to the wing-border parallel; posterior cross-vein just before middle of discal cell. There are two small pale grey suffusions over the base of the 2nd vein and the tip of the 1st, respectively; a third, over the tip of the auxiliary vein is indistinctly continued along the fork of the 2nd vein, the base of the 3rd and the anterior cross-vein, whilst there is a trace of grey suffusion over the distal sides of the discal cell and over the posterior cross-vein. Halteres blackish.

Length 9 millim.

Described from a single perfect female from Kurseong, 5. ix. 09 (*Annandale*).

Type in the Indian Museum.

The peculiarity of this species is the length of the 2nd, 3rd, and 4th veins, due to the 2nd vein originating much nearer the base of the wing than is usual, thus giving the wing some resemblance at a casual glance to that of a *Libnotes*.

292. **Limnobia centralis**, sp. nov.

♂ ♀. *Head* grey; frons very narrow, whitish grey, Proboscis and palpi dark brown, moderately pubescent. Antennæ dark brownish yellow, the ultimate joint elongated, sometimes giving the appearance of the antennæ being 15-jointed. *Thorax* varying from greyish brown to claret-brown; no obvious dorsal stripes. Scutellum, metanotum, and sides of thorax concolorous, the scutellum a little yellowish. *Abdomen* blackish, a little pubescent at the sides. Genitalia concolorous, considerably pubescent; an upper oblong moderate-sized plate, a small ventral one, a pair of large bifid claspers and a pair of pointed chitinous organs bearing

red hairs at their tips. Ovipositor yellowish. *Legs* yellowish, paler or darker; femora sometimes brown. *Wings* narrow, long, clear, iridescent, immaculate, without stigma. Auxiliary vein ending half-way between base of 2nd longitudinal and the marginal cross-vein, which latter is placed at nearly two-thirds of the length of the marginal cell; the 2nd vein beginning some distance before the middle of the wing; the præfurca being less than half as long as the remaining portion of the vein; basal part of 3rd vein oblique, twice as long as anterior cross-vein; discal cell more than twice as long as broad, upper and lower sides nearly parallel, the cell not so long as the 2nd and 3rd posterior cells; posterior cross-vein almost exactly in the centre of the discal cell; seventh vein short; all the veins running to the distal margin of the wing parallel. Halteres dirty pale yellow, clubs blackish.

Length 6–7½ millim.

Described from two males and two females from Kurseong, 18–23. vi. 10 (*Annandale*).

Types in the Indian Museum.

The position of the posterior cross-vein at the middle of the discal cell will differentiate this species from all other Oriental ones in the genus except *L. nigra* and *L. longinervis*, from each of which it is easily recognised by the entirely clear wings.

293. **Limnobia niveipes**, sp. nov.

♀. *Head* wholly black; antennæ wholly black, with very short pubescence. *Thorax* wholly dull black, with very few hairs. Traces of a very narrow white line between prothorax and anterior margin of dorsum. Scutellum, metanotum, and sides of thorax wholly dull black. *Abdomen* wholly dull black, nearly bare (possibly rubbed). Ovipositor black, small, the tip yellowish. *Legs* black, except the tarsi, which (with the exception of the metatarsal joint) are snow-white. *Wings* dark grey. Auxiliary vein ending before half the distance between the origin of the 2nd longitudinal vein and the tip of the 1st vein; venation as in *L. indica*, except that the posterior cross-vein is placed a little before the discal cell. Stigma oval, dark brown. Halteres blackish.

Length 6 millim.

Described from one female taken by me at Darjiling, 28. v. 10, on the hillside.

Type in the Indian Museum.

This species is easily distinguished from all other eastern species by its snow-white tarsi.

294. **Limnobia nigra**, sp. nov.

♂ ♀. *Head* blackish, with black hairs behind; eyes nearly contiguous; proboscis and palpi black; antennæ somewhat robust,

joints very distinct, black, with grey pubescence. *Thorax* dull black, blackish brown, or blackish grey; dorsum barely darker, sutures barely lighter. Two widely separated rows of dorso-central stiff hairs. Scutellum, metanotum, and sides of thorax concolorous. *Abdomen* black, with a little very short golden grey pubescence at the sides, and here and there on dorsum and belly, the pubescence apparently sparser in the female. Belly dark brown. *Legs*: coxæ black, remainder of legs (including trochanters) brownish yellow; tips of tarsi blackish. *Wings* very pale yellowish grey, nearly clear, iridescent. Auxiliary vein ending above the fork of the 2nd longitudinal vein, which latter originates before the middle of the wing, the præfurca being short, considerably curved, and much less than half as long as the remainder of the vein; submarginal cell distinctly longer than the 1st posterior cell; base of 3rd vein in a line with anterior cross-vein and of about the same length; discal cell twice as long as broad, considerably shorter than the 2nd and 3rd posterior cells; posterior cross-vein situated just beyond middle of discal cell; the 3rd vein and the veinlets of the 4th vein issuing from the discal cell are all lined with very short hairs. Stigma over marginal cross-vein (just beyond middle of marginal cell), small, brown, narrow but distinct, yet with ill-defined edges. Halteres yellowish, clubs blackish brown.

Length 6 millim.

Described from one male and two females taken at Pallode, 20 miles N.E. of Trivandrum, Travancore, 15. xi. 08 (*Annandale*).

Types in the Indian Museum.

The length of the longitudinal veins in the distal half of the wing approximates the wing of this species to that of *L. longinervis*. The hairy veins are a character of this species.

295. **Limnobia vitripennis**, sp. nov.

♀. *Head* yellowish brown, including proboscis, palpi, and antennæ, of which latter the scapal joints appear to be shortened (head somewhat damaged). *Thorax* dark brownish yellow, dorsum distinctly darker brown; pleuræ slightly shining. *Abdomen* blackish grey, margins of segments broadly yellowish on underside. Ovipositor black, shining; valves reddish brown, short. *Legs* brownish yellow; tibiæ a little darker. *Wings* pale grey, somewhat narrow, distinctly vitreous and iridescent. Auxiliary vein ending at one-third of the distance between the origin of the 2nd longitudinal vein and the tip of the 1st; the 2nd vein originating at the middle of the wing, the præfurca nearly as long as the remaining portion; basal part of 3rd vein longer than anterior cross-vein; discal cell not much longer than broad; posterior cross-vein distinctly before the discal cell. A brownish

spot over the marginal vein, and a less distinct one at the tip of the 2nd vein.

Length 5 millim.

Described from a female from Darjiling, taken by me on the hillside, 30. ix. 08.

Type in the Indian Museum.

Somewhat easy to distinguish by its glassy iridescent wings.

296. **Limnobia triangularis**, sp. nov.

♀. *Head*: frons very wide, dark grey; antennæ brownish yellow; proboscis yellowish, palpi darker. *Thorax* yellowish, with three light brown dorsal stripes of the usual pattern; the outer ones continued hindwards to the posterior margin, the median one running from the anterior margin to middle of the dorsum. Scutellum and metanotum brownish; sides of thorax yellowish, pleuræ apparently not darker. *Abdomen* rather pale yellowish; an indistinct narrow brown stripe on the posterior margins of most of the segments; base of abdomen a little darker. Ovipositor moderate in size, yellow. *Legs* brownish yellow. *Wings* clear. Auxiliary vein continued nearly as far as the bifurcation of the 2nd vein; the latter originating at some distance before the middle of the wing, the præfurca being much longer than the remaining portion; marginal cross-vein indistinct, opposite anterior cross-vein; basal part of 3rd vein about equal to anterior cross-vein; discal cell twice as long as broad, equal in length to the 2nd posterior cell; 3rd posterior cell triangular; posterior cross-vein in a line with the base of the discal cell. Stigma distinct, pale blackish, indistinctly outlined; the 1st, 5th, and 7th veins somewhat pronounced. Halteres yellowish.

Length 3 millim.

Described from one specimen from Barogh, in the Simla hills, 5000 ft., taken by Dr. Annandale, 10. v. 10, at the edge of a small stream.

Type in the Indian Museum.

Genus **CERATOSTEPHANUS**, *Brun.*

Ceratostephanus, Brunetti, Rec. Ind. Mus. vi, p. 271 (1911).

Genotype, *Ceratostephanus antennatus*, Brun.; by present designation.

General appearance and structure identical with those of *Limnobia*, Mg., and *Dicranomyia*, Steph. Venation as in *Limnobia*, except that the auxiliary vein, ending a little beyond the middle of the wing, is almost exactly opposite the origin of the 2nd longitudinal vein, with the subcostal cross-vein at its tip.

Eyes closely touching on the upperside for the whole distance from the vertex, also contiguous on the underside. Proboscis of

moderate length. Palpi stout, rather long, 4-jointed, 1st joint the shortest. The second generic character of importance is the extraordinary appendages to the antennæ. The 1st scapal joint is normal, moderately long, rather broader at the tip; the 2nd is large, wider, oval; both joints with stiff hairs. The flagellum consists of twelve elongate joints, each with a pair of diverging strong long bristly hairs on the upperside, situated a little beyond the base, and furnished on the underside at about the same place with a pair of large elongate conspicuous palp-like pubescent appendages. The legs are very thin and much lengthened.

Range. The genotype is the only species known.

The peculiar formation of the antennæ in this genus immediately distinguishes it from all others known from the East. There is a resemblance in the antennal appendages to Westwood's illustration of *Ozodicera gracilis*,* Westw., but that genus belongs to the subfamily TIPULINÆ.

297. **Ceratostephanus antennatus**, *Brun.* (Pl. XI, fig. 17.)

Ceratostephanus antennatus, Brunetti, Rec. Ind. Mus. vi, p. 272 (1911).

♂. *Head* blackish at the back, with a few bristles. Owing to the construction of the eyes, which are absolutely contiguous from the vertex downwards, there is no frons, but a row of irregular-sized bristles set between the eyes shows the only line of demarcation between them. Proboscis brown; palpi dark brown, pubescent, 1st joint the shortest, the others comparatively long. Antennæ with the 1st scapal joint elongate, broader at tip, 2nd enlarged considerably, oval, both with stiff hairs. The flagellum of twelve elongated cylindrical pale yellow joints, each with a pair of strong long diverging bristles on the upperside just beyond the base; on the underside, at about the same place are two dark brown elongate palp-like processes, very conspicuous, pendant, and of considerable size, with whitish pubescence. *Thorax* brownish, darker on the dorsum; scutellum and metanotum of similar colour. *Abdomen* brownish yellow, sides of abdomen and posterior margins of segments distinctly blackish; belly similar. Genitalia consisting of a pair of large linear fleshy claspers of two joints of equal length and size, below which is a horny narrow elongate style, apparently immovable. *Legs* brownish yellow; tips of femora and tarsi barely darker. *Wings*: venation as in typical *Limnobia*, except that the auxiliary vein ends just above the origin of the 2nd longitudinal vein, with the subcostal cross-vein at its tip. Colour of wing almost clear, with very numerous very small pale grey spots and short streaks covering the surface; a very slightly darker grey, just sufficient to be perceptible, over the cross-veins, the origin of the 2nd vein, tip of 1st vein, tip of

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* Trans. Ent. Soc. Lond. 1881, pl. xviii, fig. 8.

7th vein, and at two places on the costa, the first nearly basal, the second opposite the tip of the 7th vein ; in all the darker grey spots along the costa the 1st longitudinal vein is black ; in the rest of the wing the veins are generally brownish, but here and there for a short distance they are sometimes pale yellow, sometimes black. Halteres pale yellowish, clubs barely darker.

Length 4 millim.

Described from a single male from Simla, 24. iv. 07 (*Annandale*). *Type* in the Indian Museum.

Genus ATYPOPHTHALMUS, *Brun.*

Atypophthalmus, Brunetti, Rec. Ind. Mus. vi, p. 273 (1911).

GENOTYPE, *Atypophthalmus holopticus*, Brun. ; by present designation.

Allied to *Limnobia*, Mg., from which it differs only in the eyes being absolutely contiguous in both sexes from the vertex to half-way to the base of the antennæ ; they are also contiguous on the lower side in both sexes. There is a distinct neck ; the proboscis is about half the height of the head ; the male genitalia are large and conspicuous.

298. Atypophthalmus holopticus, *Brun.* (Pl. XI, fig. 9.)

Atypophthalmus holopticus, Brunetti, Rec. Ind. Mus. vi, p. 273 (1911).

♂ ♀. *Head*: vertex and back of head yellowish grey, with long stiff hairs. Eyes contiguous above in both sexes for a considerable distance, below which is a very narrow short grey frons ; they are also contiguous on the underside ; the surface of the eyes is concave.* Proboscis, palpi, and antennæ brownish yellow or pale brown, the joints subcylindrical, a little elongated ; the last joint attenuated, constricted towards the tip, making it appear almost like two joints. *Thorax*: dorsum brownish yellow, with three brownish oval spots, the upper one taking the place of the usual median stripe, situated just in front of the suture, but only extending half-way to the anterior margin ; the other two spots placed behind the suture in the usual position. Scutellum of the same colour as these spots ; sides of thorax and metanotum brownish yellow, the centre of the latter brownish, a lateral dark brown stripe across the pleuræ. *Abdomen* of male blackish ; of female more dark brownish, shining. Belly of male with the basal part of the basal segments yellowish ; in the female, belly almost wholly yellowish. Genital organs of male large, conspicuous, and complex :

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* This may be accidental, or due to shrinking after death, but the specimens are in perfect condition otherwise, and show no trace of damage, moreover the feature indicated is present in both eyes of both specimens.

a large squarish brown dorsal plate, with the corners rounded and the hind margin emarginate, with stiff black hairs on its dorsum and long yellow hairs on the hind margin; the large first joint of the claspers is irregularly shaped, longer than broad, narrower apically, where from an invaginated recess issne from each joint a strong black hook and a moderately long, cylindrical, yellowish appendage of softer texture, with a hairy tip; a very distinct inner pair of two-jointed claspers, the first joint approximately ovate, narrower at the tip, the 2nd joint evidently hard, horny, shining brown, in the shape of a long hook; there is also a peculiar, large central piece, apparently fleshy, yellowish in colour, with an obtuse tip which reaches posteriorly not beyond the 1st joint of the inner pair of claspers; this central piece enlarged below into a sort of cup-shaped cavity facing hindwards, and apparently attached to the root of the hypopygium immediately above the ventral V-shaped plate.* Ovipositor of the female apparently normal but somewhat large, especially the basal portion. *Legs* brownish yellow, tips of femora darker. *Wings* pale grey; venation practically normal. Auxiliary veiu ending nearly half-way between the beginning of the 2nd vein and the tip of the 1st longitudinal vein; discal cell nearly square, abont as long as the 2nd and 3rd posterior cells, its inner side in a direct line with the posterior cross-vein. Stigma distinct bnt ill-defined, blackish; a faint small infnscation at the base of the 2nd vein. Halteres yellow; clubs blackish.

Length 4½–5 millim.

Described from a male and female taken by Dr. Annandale in Calcntta, the male (8. ix. 10) in a spider's web, the female (20. viii. 09) in the house, at night.

Types in the Indian Musenm.

Genns LIBNOTES, *Westw.*

Libnotes, Westwood, Trans. Ent. Soc. Lond. 1876, p. 505.

GENOTYPE, *Libnotes thwaitesiana*, Westw., by original designation.

Head small, placed on a short neck, rounded, mainly occupied by the, eyes which are more or less contiguous above and below the antennæ. Proboscis comparatively short; palpi short, 4-jointed. Antennæ comparatively short; slender, 14-jointed, the 2nd scapal joint very short; flagellar joints with a single long hair on the upperside only of each joint. *Thorax* compact, oval, without conspicuous hairs. *Abdomen* short, depressed, linear, about twice as long as the thorax. Genitalia small in male, short and pointed in female. *Legs* very long and thin, microscopically

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* This so-called ventral plate appears to be the sternum of the eighth segment.

pubescent. *Wings* narrow, long, about one and a half times to twice the length of the abdomen. One marginal, one submarginal, and four posterior cells, and the discal cell always present; auxiliary vein ending at the middle of the wing, the 1st longitudinal at a little further beyond still; the 2nd longitudinal beginning before the middle of the wing at a moderately wide angle, and shortly after its origin taking a sudden angular turn upwards, thence running in a gentle curve to the margin near the tip of the wing; the 3rd vein beginning just below the 2nd, and after the short basal part, running approximately parallel with that vein to the wing-tip or just below it; the anterior cross-vein in a line with the basal part of the 3rd vein and placed at the proximal corner of the discal cell, which is considerably elongate, three or four times as long as broad; the 4th vein has the upper branch forked at the middle of the discal cell, the lower branch simple, bisinuate, all the three branches being approximately parallel to the 2nd and 3rd veins; posterior cross-vein at about the middle of the discal cell; the 5th, 6th, and 7th longitudinal veins more or less straight; subcostal cross-vein at tip of auxiliary vein; marginal cross-vein always present and distinct, placed at about the tip of the 1st longitudinal, dividing the marginal cell into two more or less equal portions.

Range. The genus is known only from the Orient and Australia except for a single species, *L. pœciloptera*, Os. Sac., which extends from Sumatra to Japan.

Owing to the peculiar venation of this genus dipterologists were puzzled for some time as to its correct place in the family; but Osten Sacken pointed out that the wing represented what might be termed an exaggerated form of *Limnobia*, the same cells being present, but through the unusual approximation of the origin of the 2nd and 3rd veins, the anterior cross-vein and discal cell towards the base of the wing, the posterior cells are all greatly elongated, which gives the wing its characteristic appearance. Judging from the four or five species I have seen the venation appears remarkably constant.

Table of Species.

1. Wing clear; body wholly bright orange..	*rufa*, Meij., p. 414.
Wing with distinct marks, body grey or dull brownish yellow	2.
2. Wing-marks on longitudinal veins of considerable length, though very narrow . .	*fuscinervis*, sp. n., p. 411.
Wing-marks on longitudinal veins reduced to very small spots	3.
3. Surface of wing with a few very pale grey spots, sufficiently large to reach from one vein to another	*notatinervis*, sp. n., p. 412.
Surface of wing without such pale grey spots	*punctipennis*, Meij., p. 413.

299. **Libnotes fuscinervis**, sp. nov. (Pl. VIII, fig. 5; Pl. XI, fig. 8.)

♂. *Head*: the distinct narrow frons and face, and the whole of the back part of the head bright yellow, with a very slight brownish tinge. Proboscis and palpi brownish. Antennal scape yellow; 1st joint long, cylindrical, 2nd short, broadly cup-shaped; flagellum of twelve oval black joints, slightly pubescent. *Thorax*: neck pale fawn, sides light brown. Dorsum of thorax pale fawn, with a wide light brown median stripe from the anterior border to the suture, where it stops abruptly, being slightly subdivided, and with a spot on each side of it; a brown band from the root of the wing to anterior border of thorax; the brown colour on the dorsum covering the whole of the thorax behind the suture, also that of the scutellum and metanotum, except for a broad yellowish fawn median stripe ending on the scutellar hind border; sides of thorax yellowish grey with light brown marks. *Abdomen* light brownish yellow; posterior borders of segments a little lighter, distinct; belly blackish with a pale median stripe. The genital organs of considerable complexity: a dorsal plate, wide at the base, narrowing to nearly half its width at about half its length, where it is also much depressed (giving the appearance of two doorsteps, the lower one much the narrower); a pair of thick claspers, of two joints of nearly equal length, approximately ovate but of somewhat irregular shape, the second of which appears to possess four slender appendages, a long and a shorter slightly curved tooth-like spine, a smaller two-jointed finger-like piece, and a strong short curved black-tipped tooth-like spine; the 1st joint of the claspers bearing at its base a short thumb-like piece towards its inner side; a ventral plate, narrow, and slightly contracted just before its tip. The whole genital organ is brownish yellow and bears very few hairs. *Legs* brownish yellow, microscopically serrate; femora with a narrow ring just before the tip; tibiæ and tarsi blackish at extreme tips. *Wings* pale grey, fore border and anterior part at tip yellowish. Submarginal cell divided by a cross-vein just before the middle, a little before the marginal cross-vein which latter exactly divides the marginal cell; this feature has not been mentioned in connection with any other species. With this exception the venation agrees precisely with that of *L. notata*, Wulp (Tijd. Ent. xxi, pl. xii, fig. 5). The veins, for the greater part of their length, carry dark brown narrow suffusions, which (judging by the three examples before me) appear to be regular in their distribution although varying in intensity. The darkened portions are as follows:—the tips of both the auxiliary and 1st longitudinal veins; all the cross-veins, and, for a short distance, the parts of the longitudinal veins connected by them; the præfurca; the basal fourth and last fourth (except the extreme tip) of 2nd vein, also more or less of this

vein in he region of the cross-veins; the basal third of 3rd longitudinal vein; approximately the distal boundary of the discal cell; the distal half of the anterior branch of the 4th vein (after quitting the discal cell); very narrowly along the 5th vein; the posterior margin of wing more or less from the tip of the 5th vein to the wing-tip; the base and tip of 7th vein, and, in a less distinct manner, a spot or two about the wing-base.

Length 10 millim.

Described from a type male in the Indian Museum from Darjiling 9. viii. 09 (*Paiva*), with a second from the same place, 5. viii. 09, and a third taken there by me, 22. ix. 08.

L. fuscinervis would come in Osten Sacken's table of the Oriental species of *Libnotes* (Berl. Ent. Zeits. xxxi, p. 182) next to *L. quadrifurca*, Walk., from which it is distinguished by the cross-vein in the submarginal cell, and by the inner end of the 2nd posterior cell being much nearer the base of the wing than that of the 3rd; also the dark marks in the wings are confined to the veins, showing no signs of forming rings, as in Walker's species.

300. **Libnotes notatinervis**, sp. nov. (Pl. VIII, fig. 7.)

♀. *Head* and frons mainly blackish brown; eyes almost contiguous, leaving a dark brownish yellow interval, facets small. Antennæ with only sparse short hairs. Neck rather bright reddish yellow, a little darker here and there. *Thorax* with anterior part of dorsum and two large oval spots behind the suture dark brown, the spots separated by a rather wide yellowish white depression, joined to the scutellum, which is uniformly of the same colour. Sides dark yellowish brown; metanotum shining, very dark blackish brown. *Abdomen* brownish yellow, the major portion of each segment from the base blackish. Ovipositor dark yellowish brown, with a little light pubescence, rather large. *Legs* yellow; a subapical, rather narrow, distinct but not deep, black ring on all the femora; tips of tarsi blackish. *Wings*: venation as in *L. notata*, Wulp; clear, costal cell yellowish; veins yellow, marked with pale grey round and oval spots, on which spots the veins become black and in some cases lightly infuscated. The more conspicuous of these spots are placed as follows:—at the base of the præfurca; a spot extending from the tip of the auxiliary vein to the 2nd longitudinal vein; a spot encircling the tip of the 1st vein and the marginal cross-vein; an oval spot at the tip of the 2nd vein; several, more or less united, along the basal half of the 3rd vein, one in the anterior basal cell; along the hind margin of the 4th posterior cell; the apical portion of the 5th vein and the distal half of the 7th vein. Along the rest of the veins similar (possibly irregular) small grey spots are placed. Halteres yellowish brown.

Length 8 millim.

Described from a unique female in the Indian Museum taken by Dr. Annandale at Kurseong, Darjiling district, 5000 ft., 6. ix. 09.

Both this species and the following one, *L. punctipennis*, would be associated in Osten Sacken's table with his own species, *L. pœciloptera*, and with Walker's *L. strigivena*.* As only one specimen is present it is impossible to say how far the markings of the wing are constant; but judging from my limited experience in the other species, the markings of any particular species appear to vary more in intensity than in pattern.

301. **Libnotes punctipennis**, *Meij.* (Pl. VIII, fig. 6.)

Libnotes punctipennis, Meijere, Tijd. Ent. liv, p. 35 (1911).

♂ ♀. *Head* with eyes nearly contiguous; occiput and the very narrow interocular space yellowish grey, the former with a few pale yellow hairs. Proboscis and palpi blackish. Antennal scape black, 1st joint slightly incrassated towards the tip; flagellum yellow, the joints subglobular at the base, becoming much more elongated towards the tip.† *Thorax* rather elongated in front, the shoulders considerably depressed. Pale yellowish, with whitish reflections when viewed from certain directions; with four brown stripes of moderate width on the dorsum: the median pair close together, and joined in front for some distance before reaching the anterior margin; outer stripes much abbreviated in front, and widely interrupted at the mesonotal suture, reappearing beyond it as a pair of elongated spots; the median stripes not going beyond the suture; traces of a brownish mark behind each shoulder. Sides of thorax pale yellowisb, a narrow brown stripe along the side of the neck reaching to the base of the wing, and a brownish horizontal streak on the pleuræ; scutellum pale yellowish, slightly brownish at sides; metanotum brownish. *Abdomen* yellowish brown, with a little pale pubescence; 1st segment at sides broadly, remaining segments at sides narrowly, and part of the dorsum of some of the segments, dark brown; belly more or less similar. Ovipositor rather conspicuous, yellowish brown. *Legs* brownish yellow; tips of femora slightly thickened, rather broadly dark brown; tips of tibiæ just perceptibly darker; tips of tarsi darker. *Wings* clear; venation as in *L. notata*, Wulp; the markings somewhat resembling those of *L. notatinervis*, the veins carrying numerous small pale grey spots, mostly circular or oval; veins yellow, except on the spots, when they become black. Slight blackish infuscations are placed as follows:—at the base of the præfurca; tip of 1st longitudinal,

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* Berl. Ent. Zeits. xxxi, p. 182 (1887).

† The prolongation of the 12th joint of the flagellum "simulating a 15th joint" according to Osten Sacken, is very distinct, though quite short.

including marginal cross-vein; tip of 2nd vein; tip of anterior branch of 4th; tips of 5th and 7th veins; base of 3rd vein, the spot extending over the anterior cross-vein; and the posterior cross-vein. Halteres pale yellow, tips of knobs black.

Length 8 millim.

Redescribed from two males and two females in the Indian Museum, from Darjiling, 6. viii. 09 (*Paiva*); Mazbat, Mangaldai district, Assam, 11–15. x. 10 (*Kemp*); and Peradeniya, Ceylon, 5. viii. 10 and 15. x. 09 (*Green*). There is a female in the Vienna Museum, also from Ceylon.

Type ♂ in the Amsterdam Museum.

Meijere described only the male. The species varies considerably in size.

302. Libnotes rufa, *Meij.*

Libnotes rufa, Meijere, Tijd. Ent. liv, p. 39 (1911).

♂ ♀. *Head* bright orange-yellow; proboscis and palpi brown; antennæ formed as in *L. fuscinervis*, dark brown, except the brownish yellow scape. *Thorax* and *abdomen*, with belly, bright orange-yellow; dorsum of abdomen with the faintest trace of a very narrow black line. Genitalia resembling those of *L. fuscinervis*, with a rather small, narrowly conical organ between the claspers and the ventral sheath. *Legs* mainly pale orange-yellow; fore femora black on distal three-fourths, posterior femora black towards tips; tarsi black at tips. *Wings* clear grey; costal cell, as far as the dark brown stigma, and base of wing orange-yellow in male, black or blackish in female; veins concolorous. Venation as in *L. notata*, Wulp. Halteres yellow; clubs black.

Length 11 millim.

Redescribed from specimens in the Indian Museum from Calcutta, 5. viii. 08 (*Annandale*), and Peradeniya, Ceylon, 13 and 17. vii. 10 (*Gravely*); also from two in my own collection from Calcutta, taken by me. Mr. E. E. Green has also sent specimens for identification from Ceylon.

Type ♀ in the Amsterdam Museum.

In Osten Sacken's table of Oriental species the present one would be separated from *L. imponens*, Walk. by the orange-yellow (not piceous) abdomen, the yellow veins and the absence of the long black stigma; but this latter character would not so easily distinguish the female. Meijere described only the female (from Java), but there can be little doubt, the male attributed here to his species is really the other sex, being quite identical in all respects except for the striking difference in the colour of the costal cell. In this species, in the specimens that have come before me at least, the 1st longitudinal vein seems to fade away at its tip instead of turning up as usual into the costa, and as the

marginal cross-vein is quite distinct and meets the 1st longitudinal in a curve, the appearance is given of the 1st longitudinal distinctly turning down into the 2nd vein as in the TIPULINÆ.

Section *RHAMPHIDIINI.*

Proboscis normally conspicuously produced,* sometimes short (*Atarba*). Antennæ usually 16-jointed, in one genus (*Toxorhina*) only 12-jointed. The wings with one submarginal cell (none in *Toxorhina*) and four posterior cells; the discal cell closed in all the Oriental genera except *Orimarga.* The auxiliary vein ends generally about the middle of the wing; it is longer in *Antocha* and *Orimarga*, but barely apparent in *Gymnastes.* The marginal cross-vein is present in *Teucholabis, Gymnastes*, and *Orimarga,* being placed about the middle of the marginal cell; it is feeble in *Antocha*; absent in *Atarba. Toxorhina*, and *Rhamphidia.* Posterior cross-vein situated before the discal cell or before its middle; in *Orimarga* placed very far back making the 4th posterior cell as long as the 2nd basal cell. The rest of the venation normally typical.

This is somewhat of a heterogeneous group still, and was classed by Osten Sacken amongst his LIMNOBINA ANOMALA, which were admittedly the genera that would not naturally fit into any of the other divisions of the family.

Table of Genera.

1. Proboscis conspicuously prolonged, at least as long as head; no marginal cross-vein	RHAMPHIDIA, Mg., [p. 416.
Proboscis shorter than head; marginal cross-vein usually present	2.
2. No submarginal cell	TOXORHINA, Lw., [p. 420.
A submarginal cell present	3.
3. Discal cell absent	ORIMARGA, Os. Sac., [p. 423.
Discal cell present	4.
4. No submarginal cross-vein	ATARBA, Os. Sac., [p. 434.
A submarginal cross-vein normally present, though sometimes faint	5.
5. Submarginal cell as long as or very little longer than the 1st posterior cell	6.
Submarginal cell much longer than 1st posterior cell	ANTOCHA, Os. Sac., [p. 425.
6. The 2nd posterior cell rectangular (approximately) at base; hind femora not clubbed.	TEUCHOLABIS, Os. Sac., [p. 427.
The 2nd posterior cell pointed at base; hind femora distinctly clubbed towards tip	GYMNASTES, gen. nov., [p. 432.

* In one genus, *Elephantomyia*, Os. Sac., which is Oriental but not Indian, the proboscis is enormously prolonged to a length much greater than that of the body. It may be noted here that in this genus the antennæ are apparently 15-jointed, owing to the coalescence of the two basal joints of the flagellum.

Genus RHAMPHIDIA, *Mg.*

Rhamphidia, Meigen, Syst. Besch. vi, p. 281 (1830); Schiner, Fauna Austr. ii, p. 558 (1864); Osten Sacken, Monog. Dipt. N. Am. iv, p. 103 (1869).
Megarhina, St. Fargeau, Encycl. Méth., Ins. x, p. 585 (1825).
Helius, St. Fargeau, *op. cit.* x, p. 831 (1825).
Leptorhina, Stephens, Cat. Brit. Ins. ii, p. 243 (1829).

Genotype, *Limnobia longirostris*, Mg.; by designation of Westwood (1840).

Head: eyes separated above by a narrow front, nearly contiguous on underside of head. Proboscis elongate, longer than the head, but shorter than the head and thorax together, moderately stout, palpi situated at its tip; their first two joints very short, the 3rd but little longer, the 4th linear, slender, about as long as the first three taken together; when at rest, the tip of the proboscis, pointing backwards, reaches but very little behind the root of the 1st joint.* The antennæ, if bent backwards, would not quite reach the root of the wings; 16-jointed, 1st scapal joint long, 2nd subglobular, both conspicuous; flagellum somewhat incrassated at its base, the joints subcylindrical, short, more elongated towards the tip, verticels moderately long. *Thorax* somewhat broad in front, prolonged into a short but distinct neck; thoracic suture deep. *Abdomen* normal. Genital organs of the male consisting of a basal plate, a pair of claspers ending in two horny hooks on each clasper. Ovipositor of female of the usual structure. *Legs* long, slender, finely pubescent; tibiæ without spurs at tip; empodia indistinct, ungues smooth. *Wings* moderately long, broader or narrower in different species; with one submarginal cell, four posterior cells, and a discal cell; 2nd longitudinal vein not forked. The auxiliary vein ending opposite the inner end of the submarginal cell, sometimes in the costa, sometimes turned down at the tip into the 1st longitudinal at some distance anterior to the tip of the latter. Subcostal cross-vein, when present, at tip of auxiliary vein; sometimes obsolete;† no marginal cross-vein; stigma present or

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* This is according to Osten Sacken, referring to the North American species *R. flavipes*, as examined by him in a living specimen. He adds that Meigen's illustration (Syst. Besch. vi, pl. lxv, fig. 8) gives a correct impression of the palpi, so presumably the characters are sufficiently definite to regard them as generic.

† Osten Sacken says "in some specimens the subcostal cross-vein is obsolete; in such cases the auxiliary vein ends in the 1st longitudinal and not in the costa." Whether by the use of the word "specimens" and not species he intends to infer that this occurrence is adventitious, is not clear. In one of the two Oriental species (*R. ferruginea*, Brun.), the auxiliary vein ends in the 1st longitudinal vein just beyond the proximal end of the submarginal cell, at a considerable distance beyond the origin of the 2nd vein, and some distance before the tip of the 1st vein.

absent; the 2nd longitudinal vein beginning about the middle of the wing (somewhat before the middle in *R. ferruginea*); præfurca longer than the remainder of the 2nd vein, but sometimes longer, sometimes shorter than the 3rd vein; the 3rd vein gently curved or straight; the submarginal cell broader at the tip than at the base;* basal part of 3rd vein very short (almost punctiform in *ferruginea*). Occasionally the anterior cross-vein is absent, and when this is the case the submarginal cell is in direct contact with the discal cell.† Discal cell approximately oblong, or of irregular shape; posterior cross-vein just beyond base of discal cell; the 5th, 6th, and 7th longitudinal veins gently curved.

Range. Europe, West Indies, South America, Australia, and the East.

This genus is very closely allied to *Elephantomyia*, Os. Sac., of which four species are known to exist in the Orient, although it does not appear to have been taken within the region covered by the present volume. The principal difference is that in *Elephantomyia* the proboscis is very slender and enormously prolonged, to a length equal to that of the whole body; the palpi being extremely small and very easily overlooked, and placed near the tip of the proboscis. The venation is almost the same as in *Rhamphidia*, including the absence of the marginal cross-vein.

Life-history.—The larva of one European species (*R. longirostris*, Mg.) lives in the stems of *Rumex aquaticus* according to Mr. Gercke, who believes that it lives under water.‡

Four species were recorded by Loew from Prussian amber ('Bernst. u. Bernst.-fauna'), but Osten Sacken noted that he had not seen them himself and that they might not belong to this genus in his acceptation of it.

Two other names have been suggested to supplant the name *Rhamphidia* for this genus: *Megarhina*, St. Fargeau (1825), which in the index to the same volume he changed to *Helius*; while Stephens in 1829 proposed *Leptorhina* (in Curtis's British Entomology) for the European species *longirostris*. Meigen described the genus under its present name in 1830 (Syst. Besch. vi, p. 281), and it is very satisfactory to at least the author of the present work, to find that the wholesale icono-

* In *R. flavipes*, Macq., a North American species, very much broader, owing to the wide divergence of the 2nd and 3rd longitudinal veins.

† This occurs in the European *R. longirostris*, Wied., and the North American *R. flavipes*, Macq. The almost punctiform nature of the junction of the 3rd vein with the 2nd in *R. ferruginea* foreshadows the disappearance of the anterior cross-vein altogether, as happens in the two non-Oriental species noted here.

‡ Verh. Ver. naturw. Unterhaltung, Hamburg, vi (1880).

clastic overthrowing of names established in some cases for nearly a century, indulged in by some present day writers, has spared a well-known genus here and there.

Table of Species.

1.	Larger species, $6\frac{1}{2}$ millim.	*ferruginosa*, sp. n., p. 418.
	Smaller species, 4 millim.	2.
2.	Pale yellow species	*unicolor*, sp. n., p. 419.
	Darker species	*inconspicua*, sp. n., p. 419.

303. **Rhamphidia ferruginosa**, sp. nov. (Pl. VIII, fig. 8; Pl. XI, fig. 11.)

♂. *Head*, with neck, brownish yellow, slightly pubescent; eyes nearly contiguous. Proboscis brownish yellow; palpi darker, comparatively narrow. Antennæ brownish yellow, with a row of bristly hairs on the 2nd scapal joint, which is rather large, and with normal pubescence on the flagellum. *Thorax*: dorsum and sides, scutellum and metanotum ferruginous brown, nearly bare, moderately shining; traces of a very narrow bright yellow line below the margin of the dorsum anteriorly. *Abdomen* dark brown, with a little pale yellow pubescence; belly ferruginous. Genitalia yellowish brown, only a large pair of claspers terminating in black hooks being perceptible. *Legs* yellowish brown. *Wings* clear. The 1st longitudinal vein ending gradually in the costa at about two-thirds the length of the wing; auxiliary vein lying very close to the 1st vein, and only perceptible towards its tip, it being nearly as long as the 1st longitudinal; præfurca nearly straight, the remainder of the vein taking a wide sweep upward, distinctly curved, a little longer than the præfurca, ending some distance beyond the tip of the 1st vein; the 3rd vein originating at the tip of the præfurca, its basal portion almost punctiform; anterior cross-vein moderately long; discal cell oblong, the three veinlets issuing equidistantly from it, nearly straight, approximately parallel; posterior cross-vein at base of discal cell. Halteres pale, knob brown.

Fig. 41.—*Rhamphidia ferruginosa*, Brun., lateral view of head.

Length $6\frac{1}{2}$ millim.

Described from one specimen from the base of the Dawna Hills, Lower Burma, 2. iii. 08 (*Annandale*).

Type in the Indian Museum.

Osten Sacken (Monog. Dipt. N. Amer. iv, p. 104) notes the varying position of the 3rd vein in some European and North American species, on account of which the anterior cross-vein is at times obliterated. Such a species (*R. flavipes*, Macq.) is figured by Needham.

304. Rhamphidia unicolor, sp. nov.

♂. *Head* with the eyes approximate, leaving a distinct yellowish-grey, moderately narrow frons. Proboscis light brownish yellow, with golden yellow pubescence; palpi concolorous, with similar pubescence. Antennal scape brownish yellow, nearly bare, joints elongate; flagellum blackish, with grey pubescence, the joints gradually becoming attenuated. Neck long, pale whitish yellow. *Thorax* pale shining yellow, with a slight trace of a narrow median darker line; sides concolorous, less shining. *Abdomen* pale yellow with whitish pubescence; belly of similar colour, as are also the inconspicuous and apparently normal genitalia. *Legs* wholly pale yellow, barely darker towards the tips of the tarsi. *Wings* pale yellow, veins deeper yellow. Venation differing from that of the previous species by the greater length of the basal portion of the 3rd longitudinal vein, the anterior cross-vein being about as long as in *R. ferruginosa*; the discal cell shorter, and more nearly square. Halteres yellowish white.

Length 4 millim.

Described from a single specimen from Darjiling, 8. viii. 09 (*Paiva*).

Type in the Indian Museum.

In the slightly different length of the basal portion of the 3rd longitudinal vein, we see in this species an approach towards the extinction of the anterior cross-vein referred to by Osten Sacken as characteristic of certain European and North American species.

305. Rhamphidia inconspicua, sp. nov.

♂. *Head* blackish grey; frons apparently about one-fifth the width of the head (the eyes being crushed inwards). Proboscis about as long as the head, dark brownish yellow, the black palpi, which are rather small, situated at its tip. Basal joint of flagellum ovate, the remainder long and slender, very indistinctly separated. *Thorax*: upper surface wholly moderately light yellowish brown, the sides dirty yellowish. *Abdomen* dirty yellowish, pubescent. Genitalia dirty brownish yellow, large, apparently normal. *Legs* dark brownish yellow, lighter on the coxæ and at the base of the femora. *Wings* nearly clear. The auxiliary vein ending in the 1st longitudinal at two-thirds the length of the wing, the subcostal cross-vein being

absent; the 1st longitudinal vein ending at a little beyond three-fourths the length of the wing; the 2nd longitudinal originating about the middle of the wing (the præfurca barely half its entire length) taking a sudden bend upwards at the origin of the 3rd vein, which latter is in a straight line with the præfurca, and ending at the wing-tip; anterior cross-vein distinct, moderately long, placed at the corner of the discal cell; 1st posterior cell with approximately parallel sides; discal cell almost oblong, shorter than the 2nd and 3rd posterior cells, of which the former is much the narrower, the latter widening at the wing-margin; posterior cross-vein in a line with inner side of discal cell; 5th, 6th, and 7th longitudinal veins almost straight; no marginal cross-vein. Halteres yellowish.

Length 4 millim.

Described from a single male from Kurseong, 16. iv. 11 (*Annandale*).

Type in the Indian Museum.

The form of venation shown in this species, *i. e.*, the absence of the subcostal cross-vein and the ending of the auxiliary vein in the 1st longitudinal, is distinctly noted by Osten Sacken in his monograph of the North American TIPULIDÆ BREVIPALPI. The absence of the marginal cross-vein is a generic character. The abnormal slenderness of the last few joints of the antennæ is very striking.

Genus **TOXORHINA**, *Lw.*

Toxorhina, Loew, Linn. Entom. v, p. 400 (1851).
Limnobiorhynchus, Westwood, Ann. Soc. Ent. France, (1) iv, p. 683 (1835).

GENOTYPE, *Toxorhina fragilis*, Loew; by designation of Osten Sacken, after a controversy. Loew originally described three fossil species, presumably more or less inadequately, and subsequently the existing species, *T. fragilis*.

Head: eyes slightly emarginate; frons narrow or very narrow. Proboscis slender, linear, practically bare, about one and a half times as long as the head and thorax together; the palpi are situated at its tip, very minute, their joints almost coalescent. Antennæ 12-jointed, hardly longer than the head; the 1st scapal joint very short, shorter in male than in female, the 2nd joint longer and much stouter, obconical; the 1st joint of the flagellum incrassate, possibly formed by the coalescence of two or three others, more or less rounded in male, more elongate, subconical in female, the remaining joints filiform; the two apical joints in the male elongate, slender, and longer than the preceding ones, this difference not being so accentuated in the female; the intermediate joints cylindrical, the basal ones, after the 1st flagellar

joint, sometimes broader than long; the scape with a few short bristles, the flagellum practically bare, the apical joints with a few long bristly hairs on the upperside.* *Thorax* rather long, and "remarkable for the great and unusual development of the mesosternum, in consequence of which the fore coxæ are at a considerable distance from the intermediate ones; the collare is entirely concealed under the projecting gibbosity of the mesonotum; on the underside the prothorax is extended into a long narrow cylindrical neck, to which the head is fastened; the metathorax is also much developed, rather long and horizontal" (*Osten Sacken*). *Abdomen* normal. Genitalia of the male something like that of *Rhamphidia*, consisting of a pair of claspers, each clasper bearing two horny appendages. Ovipositor of female long, slender, with almost straight valves. *Legs* long, slender, microscopically pubescent; tibiæ without spurs; empodia imperceptible; "the last joint of the tarsus in the male shows on the underside at the base, the excision characterizing the male sex in many genera" (*Osten Sacken*). *Wings* narrow, especially at the base; *no submarginal cell, no marginal cross-vein*, a discal cell (normally) and four posterior cells; auxiliary vein running close to the 1st longitudinal vein and ending in the costa nearly opposite the beginning of the 2nd vein, the subcostal cross-vein placed near its tip;† the 1st longitudinal vein short, entering the costa about the middle of the wing, a little beyond the origin of the 2nd vein, and, instead of running parallel to it and turning up more or less abruptly to meet it, as is the case in most genera of the LIMNOBIINÆ, it gradually converges towards the costa, eventually being merged in it, the costa, just beyond the junction of the two veins, being thus thickened; *the 2nd longitudinal vein not forked*, and therefore there is no submarginal cell; the 1st posterior cell alongside of the marginal cell throughout its length; the 2nd vein beginning just beyond the middle of the wing, and gently bisinuate, the præfurca forming nearly half its total length; anterior cross-vein of moderate length, joining the end of the præfurca to the middle of the discal cell (when latter is present); *the 3rd longitudinal vein absent*; 4th longitudinal connected with the 1st vein at their extreme bases by a distinct cross-vein; discal cell present or absent,‡ when present square, shorter than the 2nd and 3rd posterior cells; posterior cross-vein

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* Osten Sacken says that only the last two joints bear these isolated long hairs (referring to two North-American species, *T. magna* and *muliebris*); but in the present Oriental species some of the other joints are equally furnished with these characteristic hairs.

† Needham's figure of *Toxorhina* shows no subcostal cross-vein.

‡ This is an alteration from Loew's definition, to enable my species *T. incerta* to be included in the genus.

at base of discal cell or before it;* posterior branch of 4th vein widely forked a little beyond the anterior cross-vein; the 5th vein rather distinctly curved downwards at its union with the posterior cross-vein, or the whole vein gently curved; 6th vein with the peculiar character of running closely alongside of the 5th for nearly half its length, and then breaking away suddenly and running straight to the margin of the wing; 7th vein nearly straight.

Range. The three previously recorded living species come from Porto Rico and North America.

The affinities of this genus are with *Rhamphidia* and *Elephantomyia*, as demonstrated by the elongate proboscis and the absence of the marginal cross-vein. *Toxorhina*, by its venation, which is different from that of any other genus in the family, is easily recognised from either.

Osten Sacken, after his very ample description of this genus in his monograph of the North American species, enters at some length on the question of whether the generic name should stand for the single living species known to Loew (*fragilis*, from Porto Rico), described in 1851, or for three fossil species described by him (Loew) from amber in 1850, for which no *generic* description was given.

306. **Toxorhina incerta**, sp. nov. (Pl. VIII, fig. 9; Pl. XI, fig. 12.)

♀. *Head* moderately dark grey, including the underside; width of occiput one-third that of head, bare, but with some black hairs on back of head near neck. Scapal 1st joint subcylindrical, 2nd joint robust, larger, obconical; 1st flagellar joint much enlarged, narrower at tip, nearly as broad at base as 2nd scapal joint, remainder of flagellum narrow, cylindrical; the number of joints is not quite obvious:† apparently there are nine in addition to the enlarged basal joint; the last four joints have one or two long isolated hairs on each; the whole antennæ brownish yellow. Proboscis over 2 mm. in length, black, shining, bare; no palpi obvious. *Thorax* wholly dark blackish brown, including scutellum and metanotum; pleuræ similar, barely shining. *Abdomen* black, dull, belly concolorous. Genitalia very large and conspicuous, basal joints of ovipositor very robust, the terminal blades long; reddish brown. *Wings* pale grey. Auxiliary vein ending in costa just beyond origin of 2nd longi-

* In *Toxorhina muliebris*, Os. Sac., from North America, this cross-vein is at the pointed base of the 2nd posterior cell, with which cell the discal is coalescent.

† This is in accordance with Osten Sacken's statement that there are ten flagellar joints.

tudinal vein; 1st vein ending in costa a little beyond auxiliary vein;* the 2nd vein simple, gently bisinuate, ending exactly at tip of wing; no 3rd vein; anterior cross-vein moderately long, equal in length to the basal side of the discal cell, which in one wing is open and coalescent with the 3rd posterior cell, but closed in the other by a cross-vein placed just before the fork of the posterior branch of the 4th vein; lower branch of 4th vein forked widely near tip; posterior cross-vein immediately before proximal side of discal cell. Halteres black.

Length 3 millim.

Described from one female from Kurseong, 27. vi. 10 (*Annandale*).

Type in the Indian Museum.

Though the discal cell is open and there is no mention of this being the case in any of the three living species of the genus, there can be no possible doubt of the present form being a *Toxorhina* in the fullest sense. In every other way the venation agrees with Osten Sacken's plate and description. The gradual absorption in the costa of the 1st longitudinal vein, the entire absence of the 3rd vein (in itself a character of quite exceptional occurrence), are very strong generic characters. Moreover, the enormously prolonged rostrum; the absence, so far as I am aware, of palpi (Osten Sacken says they are very minute, with coalescent joints); the enlarged mesosternum, causing a considerably larger distance than usual between the fore and middle coxæ; and the peculiar form of the antennæ, agreeing exactly with Osten Sacken's description, all combine to make this species a *Toxorhina* with practical certainty.

Genus **ORIMARGA**, *Os. Sac.*

Orimarga, Osten Sacken, Monog. Dipt. N. Amer. iv, p. 120 (1869).
Ningius, Wallengren, Entom. Tidskr. ii, p. 183 (1881).
? *Spyloptera*, Rondani, Prod. Dipt. Ital. i, p. 181 (1856).

Genotype, *Limnobia alpina*, Zett.; according to, but not selected by, Coquillet (1910).

Head: eyes large, glabrous, frons rather narrow. Proboscis projecting, cylindrical, much shorter than the head. Antennæ 16-jointed, the joints shortly oval. *Thorax* rather convex and elongated in front, forming a neck; mesosternum long. *Abdomen* elongate, narrow. Genitalia of male composed of a pair of claspers, with slender horny claw-shaped second joint; lower plate elongate. In the female a small slender pointed pair of valves.

* I cannot perceive any subcostal cross-vein in my species, but it is impossible to say for certain that it is not present.

Legs long, slender, apparently glabrous, microscopically pubescent; tibiæ not spurred at tip; empodia distinct. *Wings* somewhat narrow and elongate, with one submarginal and four posterior cells, and an open discal cell coalescing with the 2nd posterior cell; *posterior cross-vein near the middle of the wing*; the auxiliary vein ending in the costa a little before the inner end of the submarginal cell, and some distance beyond the origin of the 2nd longitudinal vein; the tip of this vein (auxiliary) thickened, running obliquely into the costa and strengthening it; the 1st longitudinal ending some distance beyond the tip of the auxiliary, joining the costa some little distance before the tip of the wing; the 2nd vein beginning about the middle of the wing, quitting the 1st at a sharp angle, thence turning suddenly and running nearly straight to the margin, the præfurca forming nearly or quite half the length of the vein; marginal cross-vein just beyond the middle of the marginal cell; the 3rd vein starting at an angle, running nearly parallel to the 2nd vein; the anterior cross-vein situated soon after the origin of the 3rd vein, a little behind the marginal cross-vein, joining the upper branch of the 4th vein soon after its origin; the lower branch of the 4th vein forked, the discal cell open, coalescing with the 2nd posterior cell; posterior cross-vein placed near the middle of the wing just beyond the origin of the 3rd vein, thus much shortening the 2nd basal cell and correspondingly greatly lengthening the 5th posterior cell, which is twice as long as the 2nd posterior and nearly three times as long as the 3rd; the 5th, 6th, and 7th veins nearly straight, the two former closely approximate for the first third of their length.

Range. Europe, Australia, and India.

Orimarga has affinities with *Dicranoptycha*, from which it is easily distinguished by the unusual position of the posterior cross-vein and the absence of the discal cell, which in *Dicranoptycha* is present. Osten Sacken sees affinities with *Toxorhina* in the oblong thorax, which is narrow when seen from above; in the somewhat elongate neck; and in the extra development of the mesosternum.

308. **Orimarga peregrina**, sp. nov. (Pl. VIII, fig. 11.)

♂. *Head*: eyes rather wide apart. Proboscis bright reddish brown on basal half, dark brown on apical half; palpi black. Antennæ with 1st joint of scape long, bright reddish brown, 2nd large, rounded, blackish; flagellum yellowish brown, with a little light grey pubescence. *Thorax* yellowish, dorsum mainly brownish, the colour more or less in the form of the usual broad median dorsal anterior stripe, contiguous, or nearly so, with the shorter outer broader stripes, which latter are continued beyond the

suture, nearly to the posterior margin. Scutellum pale yellowish, metanotum brownish. *Abdomen* brownish yellow, sides narrowly black. Belly similar. Genitalia brownish yellow, of moderate size, pubescent, consisting of a large fleshy subconical 1st joint and a 2nd much shorter, slender, hook-like joint with long stiff black hairs on its underside. *Legs*: coxæ pale yellowish, remainder of legs brown. *Wings* clear, very delicately iridescent. Auxiliary vein ending just beyond half the distance between the origin of the 2nd vein and the marginal cross-vein; the 2nd vein beginning just before the middle of the wing, the præfurca being two-fifths of the length of the vein; marginal cross-vein exactly in middle of marginal cell, half-way between the tips of the auxiliary and 1st veins; the 3rd vein originating a little before the marginal cross-vein, the basal portion distinctly elbowed; anterior cross-vein opposite marginal cross-vein, equal in length to the basal side of the discal cell, which is open, coalescing with the 2nd posterior cell; posterior branch of the 4th vein forked much before half its length, making the 3rd posterior cell nearly elongate triangular; posterior cross-vein in middle of wing, just beyond origin of 2nd vein, thus making the 4th posterior cell extraordinarily long. Halteres dirty white.

Length 4 millim.

Described from a single male taken at Kurseong, Darjiling district, 29. vi. 10 (*Annandale*).

Type in the Indian Museum.

A second species of this genus has just been acquired by the Indian Museum, collected by Mr. Beebe recently in Borneo.

Genus **ANTOCHA**, *Os. Sac.*

Antocha, Osten Sacken, Proc. Acad. Nat. Sci. Philad. 1859, p. 219.
Taphrophila, Rondani, Prod. Dipt. Ital. i, p. 185 (1856).
Orimargula, Mikan, Wien. Ent. Zeitg. ii, p. 198 (1883).

GENOTYPE. According to Coquillett (1910) the species selected as type is *saxicola*, Os. Sac., one of the original two; but according to Kertész's Catalogue of Diptera the name of the species should be *opalizans*, Os. Sac., with *saxicola* as a synonym.

Head: eyes separated above by a narrow frons, below almost contiguous. Proboscis cylindrical, moderately projecting; palpi slender, rather prolonged, 1st joint elongate, 2nd and 3rd shorter, 3rd somewhat elongate. Antennæ if bent backwards would not reach the root of the wing; sixteen-jointed; 1st scapal joint short; flagellar joints subglobular, apical joint rather elongate, the flagellum bearing moderately short hairs on the upperside and somewhat close pubescence on the underside; no distinct verticels. *Thorax* prolonged anteriorly, though not conspicuously, the suture

distinct. *Abdomen* normal. Genitalia of male consisting of the usual claspers, the 2nd claw-like horny joint very small. *Legs* rather shorter than usual, moderately stout; tibiæ without spurs at the tip; empodia indistinct, ungues very small with teeth on the underside at the base. *Wings* fairly broad, iridescent, anal lobe of wing approximately rectangular. One submarginal cell, a discal cell, and four posterior cells; auxiliary vein approximating very closely to the 1st longitudinal vein, not easily distinguished, ultimately coalescing with it, the united veins gradually merging in the costa, which is thickened at and beyond their junction, this taking place near the tip of the wing; subcostal cross-vein absent; marginal cross-vein feeble; the 2nd longitudinal vein not forked, beginning much before the middle of the wing at a very acute angle, and at the origin of the 3rd vein, it is, in some species, angled again, the remaining part being as long as the præfurca; the 3rd vein as long as, or a little longer than the apical half of the 2nd vein, gently bisinuate; anterior cross-vein placed at the middle of the discal cell or at its proximal upper corner, opposite the marginal cross-vein; discal cell approximately rhomboidal or of irregular shape (pentagonal in *opalizans*, Os. Sac., of North America), a little less in length than the 2nd and 3rd posterior cells, though this proportion probably varies with the species; posterior cross-vein situated at the base of or distinctly before the base of the discal cell; the 5th vein absolutely straight, the 6th and 7th practically so. Stigma elongate, not very sharply defined. The wings are said to have a milky white tinge, but this is not very apparent in the two Oriental species at present known.

Range. India, Europe, Canada, United States.

The two Indian species may be separated thus:—

Posterior cross-vein distinctly anterior to discal cell; thorax with three stripes	*indica*, sp. n.
Posterior cross-vein at basal corner of discal cell; thorax with one median stripe only.	*unilineata*, sp. n.

308. **Antocha indica**, sp. nov. (Pl. VIII, fig. 12.)

♂ ♀. *Head* yellowish, occiput dark grey; proboscis and palpi brown with a few bristly hairs; eyes well separated. Antennæ blackish, rather thickly pale pubescent, joints oval, distinct; 1st scapal joint yellowish, 2nd very short, black. *Thorax* yellowish; the usual three dark stripes nearly contiguous; sides of thorax yellowish; scutellum and metanotum brownish grey, lightly dusted. *Abdomen* brownish yellow, one example (the type) showing a dark line towards each side. Genitalia of moderate size, yellow. *Legs* yellow or brownish yellow. *Wings* colourless; veins yellowish, costa yellow, no stigma; marginal cross-vein invisible in one example; anterior cross-vein just before middle of

discal cell; posterior cross-vein distinctly anterior to discal cell; veins on discal part of wings with minute hairs.

Length 4–5 millim.

Described from seven males in the Indian Museum from:— Kurseong, 9. ix. 09 (*type*) and 16. iv. 11; Phagu, 12. v. 09, and Theog, Simla Hills, 2. v. 07 (all taken by *Dr. Annandale*), and two females, Kurseong, 16. iv. 11 (*type*), and Mangaldai district, Assam-Bhutan Frontier, 26. xii. 10 (*Kemp*).

309. **Antocha unilineata**, sp. nov.

♀. *Head* dark; antennæ brownish yellow, flagellar joints oval. *Thorax* brownish yellow, dorsum barely darker; a median narrow distinct blackish line from the anterior margin to the suture; scutellum and metanotum concolorous. *Abdomen* darker than the thorax, otherwise apparently concolorous. Ovipositor yellowish, normal. *Legs* pale yellow, tips of femora and the tarsi wholly, darker. *Wings* very pale yellowish grey; stigma very indistinct, hardly perceptible. Anterior cross-vein opposite marginal cross-vein; discal cell almost exactly equal to the 2nd posterior cell; 3rd posterior cell pointed at base; posterior cross-vein at inner corner of discal cell. Halteres pale yellow.

Length barely 4 millim.

Described from a single female in the Indian Museum from Mundali, Dehra Dun district, 9000 ft., 10. v. 10.

Genus **TEUCHOLABIS**, *Os. Sac.*

Teucholabis, Osten Sacken, Proc. Ac. Nat. Sci. Philad. 1859, p. 222; id., Monog. Dipt. N. Amer. iv, p. 129, pl. i, fig. 12, and pl. iii, fig. 9 (1869); id., Berlin. Ent. Zeits. xxxi, p. 188, notes.

GENOTYPE, *Teucholabis complexa*, Os. Sac., the original species.

Head: eyes separated by a distinct frons above, nearly contiguous below. Palpi short, inserted at the tip of the short cylindrical proboscis, last joint very short. Antennæ of sixteen joints, of moderate length; if bent backwards they would not quite reach the base of the wing; scapal joints normal; flagellum with oblong or rounded, well-separated joints, the verticels of which are a little longer than the pubescence. *Thorax* somewhat gibbous; neck conspicuously elongated, but shorter than the head. *Abdomen* of moderate size, robust. Genitalia of male considerably hairy, their structure not easily seen in dried specimens; consisting of two oblong lobes, somewhat resembling those of *Dicranomyia*, bearing large, horny appendages on the underside; a ventral plate is present, drawn out posteriorly to a narrow point. In the female the ovipositor is of moderate size, slender, arcuated. *Legs* moderate in length, distinctly robust, closely and

conspicuously pubescent; ungues apparently smooth, empodia small but very distinct. *Wings* comparatively short and broad, very clear except in the parts ornamented by brown bands; veins very distinct; stigma generally short and rounded, or indistinct. One submarginal cell, four posterior cells, and a discal cell; auxiliary vein ending about the middle of the wing, a little before the tip of the 1st longitudinal; the 2nd longitudinal vein begins considerably before the middle of the wing, the præfurca generally curved, sometimes nearly straight, about equal in length to or much shorter than the rest of the vein; marginal cross-vein placed at about the middle of the marginal cell, uniting it with the 1st longitudinal vein near the tip of the latter; marginal cross-vein, base of submarginal cell and anterior cross-vein often more or less in a line, less so in the Oriental species; the 3rd vein gently curved; discal cell elongate, broader distally than proximally; posterior cross-vein near the base of the discal cell, approximately opposite the anterior cross-vein, and placed a little forward or backward, according to the species; the 5th and 6th veins straight or nearly so, the latter sometimes slightly bisinuate, 7th gently curved.

Range. India, Ceylon, United States, Mexico, West Indies, Brazil, and Australia.

The species of this genus have a facies peculiarly their own, and amongst a general collection of TIPULIDÆ can easily be recognised, once the genus is understood. Their well-set, robust appearance, subgibbous thorax, long neck, comparatively short, robust hairy legs, very clear wings (in the hyaline parts), short auxiliary and 1st longitudinal veins, with the general distinctness of all the veins, characterise them as a well-defined, homogeneous group.

Table of Species.

1. Femora without distinct rings	2.
Femora with one or with two distinct pale yellow subapical rings	3.
2. Thorax ferruginous red, with three stripes (the outer ones often indistinct, sometimes all three absent); wings brownish grey with two ill-defined, subhyaline patches	*fenestrata*, Os. Sac., p. 429.
Thorax (except the orange front) wholly shining dark blue; wings brown, with two large central, subhyaline patches. .	*insignis*, sp. n., p. 430.
3. Thorax brownish yellow; femora with two subapical pale rings; species 6 mm. long	*biannulata*, sp. n., p. 430.
Thorax shining blue-black; femora with one pale subapical ring; species 3½ mm. long	*cyanea*, Edw., p. 431.

310. **Teucholabis fenestrata**, *Os. Sac.* (Pl. VIII, fig. 14; Pl. XI, fig. 10.)

Teucholabis fenestrata, Osten Sacken, Berl. Ent. Zeits. xxxi, p. 188, ♂ ♀ (1887).

"Dark brown, thorax ferruginous red, shining, striped with black; wings brownish, subhyaline on the proximal half. Length 5–6 mm.

"Head, antennæ and palpi black, front shining. Thorax ferruginous red, shining, with black stripes; the intermediate stops before the collar, the lateral ones sometimes are indistinct; hind part of metanotum, and sides of pectus blackish. Abdomen, including the male genitals, dark brown; ovipositor reddish yellow; halteres brown; legs, including coxæ, dark brown or black, hairy, rather stout. Wings tinged with brown, except a large subhyaline space on the proximal half, between the 1st vein and the hind margin; this hyaline space does not quite reach the central cross-veins; and it touches the hind margin only between the root and the anal angle; a second, much smaller, hyaline spot, ill-defined in outline, on the distal half of the wing, between the 2nd and 4th veins, usually covering the cross-veins at the end of the discal cell

"Hab. Ceylon; a male and a female in Mr. Bigot's collection; also specimens in the Museum at Leiden.

"Undoubtedly a *Teucholabis*, although of a somewhat different type than *T. bicolor*. The distal cell is comparatively smaller here, and much shorter than the 2nd posterior cell, while in *T. bicolor* it is a little longer; the collare is a little less developed; the 1st longitudinal vein extends a little beyond the marginal cross-vein; and the slight enlargement of the costal cell, near that cross-vein, which exists in the typical species, is not visible here." (*Osten Sacken.*)

From an examination of a good series of males and one or two females in the Indian Museum, the following notes may be appended to Osten Sacken's description.

The dorsum of the thorax is more often wholly ferruginous than otherwise, a distinct stripe, much less three, being apparently the exception, although there are not infrequently indistinct brown suffusions in parts. The legs are sometimes dark yellowish brown, the coxæ occasionally reddish yellow, and the subhyaline spaces in the wings are mostly indistinct or absent.

The Indian Museum has it from Kurseong, 3. vii. 08 (*Annandale*); Naini Tal, 14–17. iv. 07; Khasi Hills, Assam; Mazbat, Mangaldai district, Assam, 11–15. x. 10 (*Kemp*); Peradeniya, Ceylon, 26. vii. 10 (*Gravely*), one of the very few females seen by me. It is in the Pusa collection from Darjiling, 3–9. vi. 09 (*Howlett*), and the Khasi Hills; whilst it figures in Mr. Green's collection from Ceylon, where it is common, the males hovering in small clusters under trees overhanging roads.

311. **Teucholabis insignis**, sp. nov. (Pl. VIII, fig. 13.)

♂. *Head* elongated; the very wide frons, the nasus and the palpi, shining black, with a few scattered hairs; eyes nearly contiguous below. The 1st joint of the antennal scape is cylindrical, cup-shaped at tip; 2nd subglobose; 1st joint of the apparently only 12-jointed flagellum robuster than the rest, which are oval, black, with some long hairs. *Thorax*: neck and whole anterior part of thorax bright orange-yellow with some long black hairs; remainder of dorsum, the scutellum, metanotum and sides, wholly brilliant shining dark blue, with scattered soft black hairs; a dark reddish streak below, between the posterior pairs of coxæ. *Abdomen* wholly very dark shining blackish blue, with soft whitish pubescence. Genitalia concolorous, pubescent. *Legs* wholly deep black (except the orange-red fore coxæ and trochanters), closely but thickly pubescent. *Wings* brownish, with two subhyaline patches occupying the greater part of the discal surface, divided by an irregular cross-band, which begins round the marginal cross-vein and extends posteriorly nearly to the hind border of the wing. Venation as in Osten Sacken's Monograph of the North American Tipulidæ, pl. i, fig. 12. Halteres dark blackish brown.

Length 7 millim.

Described from a unique male in the Indian Museum collection taken by Dr. Annandale, 22. xi. 08, at Tenmalai, Travancore State, South India. A very pronounced and handsome species.

312. **Teucholabis biannulata**, sp. nov.

♂. *Head*: eyes very nearly contiguous; frons, occiput and head generally, dark brown; neck brownish yellow, bare, shining. Scape brownish yellow, the 2nd (yellowish) joint short; flagellum dark brown, with some long hairs on upperside only. Proboscis and palpi dark brown. *Thorax* dark brownish yellow, shining, with two distinct dorso-central rows of short black hairs; sides of dorsum, a median stripe, and two large spots occupying the whole surface behind the suture (except the intermediate pale whitish depression), a darker brown; sides of thorax moderately dark brown, shining. Scutellum very shining, blackish grey; metanotum yellowish, with a faint median dark line. *Abdomen* mainly dark brownish yellow, with traces of a thin dorsal black line; with thin black pubescence. Belly lighter yellowish, the whole abdomen appearing liable to vary in places. Genitalia conspicuous, brownish yellow, considerably pubescent; a dorsal and a ventral short broad plate; a large pair of claspers with what seems like a thumb-like organ attached to each; each clasper also furnished at the tip with two large black hooks. *Legs* black, microscopically pubescent: base of femora (more broadly so in fore pair) yellow, also a subapical moderately broad ring and an apical narrow ring, yellow. *Wings* moderately dark grey; costal cell yellow. Black marks placed as follows:—one spreading over

the base of the basal cells, the colour continued forward into the 1st basal cell, leaving a small clear spot; a square spot over base of præfurca and extending across the middle of the 1st basal cell almost to the 4th vein; an irregular long spot beginning on the costa above the tip of the 1st vein and marginal cross-vein, extending downwards to the distal end of the 1st basal cell; a small, very dark spot over subcostal vein. Pale blackish irregular markings over tip of wing, over the cross-veins and distributed over hinder part of wing. Halteres yellowish, clubs black.

Length 6 millim.

Described from a perfect male from Kurseong, 26. vi. 10 (*Annandale*).

Type in the Indian Museum.

Easily recognised by its tesselated wing-markings.

313. **Teucholabis cyanea**, *Edw.*

Teucholabis cyanea, Edwards, Ann. Mag. Nat. Hist. (8) viii, p. 61 (July 1911).

♂ ♀. "Cyanea, abdomine purpureo-cyaneo; pedibus luteis, femoribus apice nigris incrassatis; alis fasciis 4 fuscis.

"*Head* shining dark purple, almost metallic, slightly hairy on vertex. Antennæ with the scape ochreous, the flagellum fuscous, clothed with a rather dense pubescence; joints ovate-cylindrical, about twice as long as broad. *Thorax* shining blue-black, sub-metallic; mesopleuræ dull whitish. *Abdomen* with the 1st segment and the base and sides of the 2nd shining blue-black, the remainder of the dorsum purplish brown, somewhat shining, venter brown. *Legs*: coxæ, trochanters, and basal $\frac{3}{5}$ of femora ochreous, apical fourth of femora brownish or purplish black, preceded by a pale ochreous ring; the apices of all the femora are thickened, those of the hind legs to the greatest extent. Tibiæ and tarsi of the fore and hind legs greyish ochreous, darker towards the tips. Hind tibiæ with the basal two-thirds ochreous, apical third blackish and somewhat thickened. Hind tarsi blackish except for basal half of metatarsus, which is ochreous. *Wings* hyaline, iridescent, with four brown cross-bands, which are darker towards the costa; the first of these is at the base of the basal cells, the second is mainly before, but includes the origin of the præfurca: the first extends only half-way across the wing and is connected with the second by a longitudinal brown patch occupying the space between the 5th and 7th veins; the third and broadest band includes the cross-veins, lying mainly beyond them; it is broadest in the middle of the wings, and extends to the apex of the discal cell; the fourth band occupies the whole of the apex of the wing. The præfurca arises about the middle of the wing, and is obtusely angulated near its base. Marginal cross-vein considerably beyond the fork of the radial vein, and near the termination of the subcostal. Small cross-vein almost in a line with base of submarginal cell, situated at the base of the discal

cell. First posterior cell very slightly contracted at apex. Discal cell very narrow, tapering almost to a point at the base. Sixth vein slightly sinuous. Wing margin indented at the terminations of the 6th and 7th longitudinal veins. Great cross-vein a little beyond the base of the discal cell. Halteres black, apical half of knob white." * (*Edwards.*)

Length $3\frac{1}{2}$ millim.

Described from a single male from Madulsima, Ceylon, 19. v. 08 (*T. Bainbrigge Fletcher*) and a single female from Bentota, Ceylon, 13. vi. 90 (*Lt.-Col. Yerbury*).

Types in the British Museum.

The author adds: "The uniform blue-black colour of the dorsum of the thorax will distinguish this species from any other in the genus. It is the smallest species, except for *T. polita*."

Genus **GYMNASTES**, *Brun.*

Gymnastes, Brunetti, Rec. Ind. Mus. vi, p. 281 (1911).

GENOTYPE, *Gymnastes violaceus*, Brun.; by present designation.

Head set closely on the thorax, without any neck. Eyes rounded, bare, widely separated above by a very broad frons, separated on underside by a moderately wide, parallel, rather convex space. Proboscis stout but very short; palpi four-jointed, narrow, cylindrical, normal length. Antennæ of sixteen joints; the 1st scapal joint rather short, cylindrical, 2nd much narrowed, about the same length; flagellar joints cylindro-ovate, the 1st longer than the rest, about equal to the 2nd scapal joint. *Thorax* moderately arched; collare rather enlarged and distinct, suture distinct, post-sutural depression not very pronounced; scutellum small. *Abdomen* linear, of only seven obvious segments. Genitalia normal. *Legs* moderately long and slender; anterior femora slightly enlarged towards the tip, hind femora longer than the others and very considerably enlarged at the tip, having the appearance of "Indian clubs"; metatarsus more than half the length of the tibia, the other joints short; tibiæ without spurs at the tip, but the hairs are considerably stronger about the tip of the tibia. *Wings* elongated, narrowed at base and slightly curved inwards near the basal part of the costa. One submarginal cell, four posterior cells and a discal cell; auxiliary vein barely apparent, so closely approximate to the 1st longitudinal vein that it is only visible just before the middle of the latter vein, where that vein takes a sudden V-shaped bend downwards, forming a "kink": the 1st vein sinuous towards its tip, ending beyond the middle of the wing; 2nd longitudinal vein beginning just before the middle of the wing, running nearly straight to the margin; the marginal cross-vein a short distance from the tip of the 1st vein; the 2nd vein unforked; the 3rd vein originating just before the marginal

* The order of description of the parts of the body is slightly altered from that of Mr. Edwards to preserve uniformity with the rest of this work.

cross-vein, its basal section short, the rest of the vein straight; anterior cross-vein nearly in a line with the basal section of the 3rd vein, situated at the base of the discal cell, the 1st posterior cell having approximately parallel sides; the 4th vein emerging from the 5th at some considerable distance from its base, forming a right angle, and in contact with the "kink" in the 1st longitudinal vein immediately above; upper branch of 4th vein forked immediately on quitting the discal cell, the two veinlets springing simultaneously and diverging, making the 2nd posterior cell pointed at its basal end; discal cell quadrangular, very narrow, slightly broader at the tip; lower branch of 4th vein forming, with its basal section, a gentle curve; posterior cross-vein situated at the base of the discal cell, making the 4th posterior cell nearly as long as the 2nd basal cell; the 5th vein gently curved at the tip, the 6th nearly straight, the 7th nearly straight, moderately short, the wing-margin a little emarginate where the vein ends.

314. **Gymnastes violaceus**, *Brun.* (Pl. VIII, fig. 10.)

Gymnastes violaceus, Brunetti, Rec. Ind. Mus. vi, p. 282 (Dec. 1911).

♂. *Head*: frons brilliantly shining violet-blue, with an isolated hair here and there; face below antennæ blackish, dull. Proboscis

Fig. 42.—*Gymnastes violaceus*, Brun.

yellowish, palpi brownish. Antennæ brownish yellow, becoming a little darker brown towards the tips; with close yellowish white pubescence on the flagellum, the scape bearing only a few short bristly hairs. *Thorax* brilliantly shining violet-blue, an irregular row of dorso-central short yellowish hairs; scutellum blackish

grey, dull. *Abdomen* brilliant, shining violet-blue, with traces of pale yellow, very short hairs on the posterior margins of the segments, and more distinct, similar hairs at the sides of the abdomen. Belly similar. Genitalia moderately large, consisting of a basal pair of cylindro-ovate large fleshy claspers, with a second joint consisting of a long narrow horny slightly curved appendage. *Legs* yellowish; a subapical broad dark brown ring on the femora and tibiæ, both bands darker and broader on the hind pair of legs; tarsi black except the yellowish basal half to all the metatarsi. *Wings*: venation in accordance with the generic characters; nearly clear, with four cross-bands, moderately blackish, all beginning on the costa; the first two narrow, beginning respectively over the "kink" in the 1st longitudinal vein (in front of the origin of the 4th vein), and the origin of the 2nd vein, both continuing posteriorly as far as the 7th vein, where they meet, the 7th vein being clouded anteriorly; the third band is the widest and begins on the costa widely on each side of the marginal cross-vein, continuing posteriorly, embracing the cross-veins and the whole of the discal cell, to the posterior margin of the wing, where it becomes fainter; the fourth band is apical, fairly wide, its proximal edge a straight line, cutting the 1st posterior cell at two-thirds its length from the base. Halteres with narrow black stem, the clubs with conspicuous chalk-white tips.

Length $2\frac{1}{4}$–$2\frac{1}{2}$ millim.

Described from three males taken at Kandy, 22. v. 10 (*type*), and Peradeniya, 15. vii. 10 (*Green & Gravely*).

Type in the Indian Museum.

A very distinct and conspicuous species belonging to a peculiarly distinctive genus.*

Genus **ATARBA**, *Os. Sac.*

Atarba, Osten Sacken, Monog. Dipt. N. Am. iv, p. 127, pl. i, fig. 13 (1869).

Leiponeura, Skuse, Proc. Linn. Soc. N. S. Wales (2) iv, p. 795 (1890).

Genotype, *Atarba picticornis*, Os. Sac., the original species.

Head: eyes glabrous, front rather narrow, proboscis but little projecting; palpi rather long, especially the last joint. Antennæ 16-jointed, rather long, reaching beyond the base of the abdomen, if bent backwards; 1st scapal joint short, not much longer than the 2nd; joints of the flagellum elongated, cylindrical, gradually decreasing in length, clothed with a fine pubescence; a single somewhat longer hair is perceptible on each segment, above the pubescence; the antennæ of the female are but little shorter than those of the male. *Thorax*: neck short, the head rather closely

* This description was written some time before I had read the description of *Teucholabis cyanea*, Edw., with which my species is perhaps synonymous, though this is not certain. In any case the genus *Gymnastes* appears to be a sound one, being based on the absence of a neck and on the conspicuously clubbed femora.

set on the thorax; thoracic suture distinct. *Abdomen* normal. Genital organs of the male large and hairy; the basal pieces leave an open interval between them, even when the claspers are folded together; the ends of the claw-shaped appendages are distinctly bifid, showing that they consist of two closely approximated horny pieces; a short stump takes the place of the ventral plate, one of the specimens having a "long curved aculeus" projecting on the underside. *Legs* moderately long, comparatively stout, finely pubescent; ungues smooth, empodia distinct; tibiæ probably without spurs at the tip.* *Wings* with one submarginal cell, four posterior cells and a discal cell; no marginal cross-vein; tip of auxiliary vein and origin of 2nd longitudinal vein at a little beyond the middle of the wing; præfurca short, curved, barely one-third as long as remainder of wing; the 3rd vein with a short basal portion, which is approximately in a line with the proximal side of the discal cell and the posterior cross-vein; discal cell approximately square, half the length of the 2nd and 3rd posterior cells; 5th vein only slightly bent at its junction with the posterior cross-vein; 6th and 7th veins nearly straight.

Range. India, Australia, United States, West Indies.

315. **Atarba flava**, sp. nov. (Pl. VIII, fig. 15.)

♂ ♀. *Head* and all its appendages pale buff-yellow, sometimes a little ochraceous. Frons one-fourth the width of the head, very slightly narrower towards antennæ; eyes barely contiguous on underside; vertex and back of head with long yellow hairs, which are present on the frons also. Proboscis robust, of moderate length, palpi a little darker, both with yellow hairs. *Thorax* wholly concolorous, dorsum elevated; some long yellow hairs on the shoulders and towards the margins. *Abdomen* concolorous, rather liberally covered with long pale yellow hairs; margins of segments with a trace of a brownish tinge. Ovipositor brownish yellow. *Legs* concolorous, with rather thick pale yellow pubescence; tips of femora narrowly, tips of tibiæ more narrowly, and tips of each tarsal joint almost imperceptibly black. *Wings* yellow; veins yellow, distinct. Auxiliary vein ending at some distance beyond the origin of the 2nd longitudinal, which originates just before the middle of the wing, the præfurca being nearly as long as the remaining portion; the subcostal cross-vein placed half-way between the origin of the 2nd vein and the tip of the auxiliary; the 1st longitudinal vein ending about opposite the distal side of the discal cell; basal section of 3rd vein longer than anterior cross-vein, which is placed at an angle of 45° with the corner of the discal cell; this latter a little longer than broad, about half

* Osten Sacken in his description of this genus left the question of the presence or absence of spurs at the tip of the tibiæ unsettled, as in the specimens before him, the feet were absent, but he notes a recollection of having seen spurs on the middle tibiæ before they were broken off.

as long as the 2nd and 3rd posterior cells; posterior cross-vein placed just before the middle of the discal cell; all the veins running to the distal margin of the wing, approximately parallel Halteres pale yellow, clubs barely darker at tips.

Length 4–5 millim.

Described from four males and one female in the Indian Museum from Darjiling, where it evidently is to be found on the hillsides each autumn. The dates are: type male 28. v. 10, type female 26. v. 10. two other males 22. ix. 08 and 1. x. 08, all these being captured by me; the remaining male taken by Mr. Paiva at the same place, 9. viii. 09.

Types and cotypes in the Indian Museum.

This is evidently an *Atarba*, the discrepancies from the three North American species of which figures are accessible being very small. Moreover, slight differences in the venation of these three species, *A. puella*, Will., *pleuralis*, Will., and *picticornis*, O. S., are apparent. With Osten Sacken's generic description this species entirely agrees, and it only varies in venation from Needham's figure of *picticornis* by the posterior cross-vein being placed nearly at the middle of the discal cell instead of in a line with its basal side.

In *picticornis*, too, the auxiliary vein reaches some short distance beyond the origin of the 2nd longitudinal, and the veins running to the distal wing-margin are practically parallel, or only very slightly divergent, both these characters coinciding with those of *flava*. In the other two North American species mentioned, the 2nd vein curves distinctly upward, especially in *pleuralis*, whilst the 3rd vein very distinctly curves downward making the submarginal cell very widely open on the wing-margin; whereas in both *flava* and *picticornis* both veins are almost exactly equidistant from each other and from the 1st longitudinal and anterior branch of the 4th longitudinal respectively.

Section *ERIOPTERINI.*

Eyes bare, separated above by a more or less wide frons, contiguous or approximate on the underside. Antennæ 16-jointed. Tibiæ without apical spurs, empodia distinct, ungues smooth on the underside.

Wings with two submarginal cells; four, sometimes five, posterior cells; discal cell closed or open (very variable in some genera, often in the same species). In many genera the veins are distinctly pubescent (to a varying extent in some genera, such as *Erioptera*, according to the species); in others the surface of the wings, as well as of the veins, is covered with hairs.

The subcostal cross-vein is sometimes placed at a considerable distance anterior to the tip of the auxiliary vein (*Erioptera*,

Rhypholophus), sometimes not much before it or near its tip (*Gonomyia*, *Empeda*, *Gnophomyia*, *Symplecta*). This difference occurs in unquestionably closely allied genera. For instance, it is quite a long distance before the tip of the auxiliary vein in *Paracladura*, Brun., and *Cladurorides*, Brun., yet only a little before the tip in *Cladura*, Os. Sac. This very distinct difference of position of the subcostal cross-vein in undoubtedly allied genera indicates that the importance of this character has been overestimated by some authors.

The 2nd longitudinal vein presents a peculiarity in one group of genera, by the upper branch being almost upright, thus having much the appearance of a cross-vein; in fact, some of the older authors regarded it as such. This is the principal character of the *Gonomyia* group, which includes, besides *Gonomyia*, *Empeda*, *Monogoma*, and two new genera constructed by me out of the latter, *Paramongoma* and *Mongomioides*. An intermediate genus, *Gnophomyia*, with the upper branch of the 2nd longitudinal vein not upright, but more or less parallel with the lower one, may be regarded as joining the *Gonomyia* group to the *Erioptera* group, as some authors consider; or as forming a link between the *Gonomyia* group and the section LIMNOPHILINI, my own opinion inclining towards this latter view.

Altogether this section is rather a mixed one, and although it may be considered as intermediate between the LIMNOBIINI and the LIMNOPHILINI, it may, speaking more narrowly, still be regarded mainly as a collection of groups.

These groups (referring to the Oriental genera only) may be considered to be three in number. One, the *Cladura* group, is characterised by the presence of five posterior cells, by which the genera may be easily differentiated from all others. They are *Cladura*, *Paracladura* and *Cladurorides*, with a rather aberrant genus *Conosia*, Wulp, which, however, undoubtedly belongs here by virtue of its five posterior cells. The second group is formed of the genera surrounding *Erioptera*, including *Rhypholophus*, Kol., *Molophilus*, Curt., and *Mesocyphona*, Os. Sac. The most conspicuous character of this group is the presence of stiff hairs along at least the posterior portions of all the veins; whilst one genus (*Rhypholophus*) has the membrane of the wing also closely pubescent.

The remaining group centres round *Gonomyia*, and is prominently distinguished by the upright or nearly upright position of the anterior branch of the 2nd longitudinal vein, which appears almost as a cross-vein, thus making the 1st submarginal cell only about half as long as the 2nd. The genera comprised form a tolerably compact group; they are, *Gonomyia*, *Empeda*, *Monogoma*, and my two new genera constructed from it, with the addition of two rather aberrant genera, which, however, undoubtedly belong here, namely, *Lechria*, Skuse, previously only known by one species from Australia, and the equally abnormal genus *Styringomyia*, Lw., which till 1887 was known from a fossil species only.

In that year Osten Sacken mentions an undescribed recent species in the Stockholm Museum from Caffraria.

These two genera, though distinctly abnormal, are eminently related to *Gonomyia* and its allies by the position of the anterior branch of the 2nd longitudinal vein and also by irregularities concerning the 3rd longitudinal vein and the anterior cross-vein.* *Gonomyia*, in certain species, foreshadows these irregularities, including that of the absence of the anterior cross-vein, for it comprises species possessing either one or two submarginal cells, and exhibits a variation of venation which makes it suitable as a central genus around which to arrange the others. This variability also is sufficient to prevent its dismemberment, since all the species show sufficient resemblances to retain them under one genus.

I retain *Gnophomyia*, Os. Sac., and *Symplecta*, Mg., together, in accordance with recent Catalogues, but it has often occurred to me that *Gnophomyia*, with its greater degree of "parallelism" in the veins, and its posterior cross-vein near the middle of the discal cell, was in some way a connecting link between *Gonomyia* and the Limnophilini, whilst *Symplecta*, by its general appearance and its posterior cross-vein before the discal cell, reminds one rather strongly of the Limnobiini, although its place in this section cannot, of course, be questioned.

Table of Genera of Eriopterini.

1. Four posterior cells (three only in *Paramongoma*)	2.
Five posterior cells	15.
2. Wings distinctly hairy, even if only along the veins; often very conspicuously so	3.
Wings practically bare	6.
3. Wings closely pubescent over the whole surface as well as on the veins.	Rhypholophus, Kol., [p. 440.
Wings pubescent along the veins only .	4.
4. The 3rd longitudinal vein emerging from the lower branch of the 2nd, thus making the 1st submarginal cell longer than the 2nd............	Molophilus, Curt., p. 443.
The 3rd longitudinal vein emerging as usual from the præfurca, thus making the 1st submarginal cell shorter than the 2nd..........................	5.
5. Posterior branch of 4th longitudinal vein forked	Erioptera, Mg., p. 445.
Anterior branch of 4th longitudinal vein forked	Mesocyphona, Os. Sac., [p. 458.
6. The 1st submarginal cell short, not more than half as long as the 2nd ..	7.
The 1st submarginal cell long, much more than half the length of the 2nd.	13.

* This question is fully dealt with in the notes under *Gonomyia* (p. 468).

7. Venation abnormal, only one submarginal cell,* the veins in the anterior part of the wing distorted somewhat from their usual positions . STYRINGOMYIA, Lw., p. 459.
   Venation normal (except *Lechria*); the veins in the anterior part of the wing bearing their usual relations to one another .... 8.
8. Marginal cross-vein absent .... 9.
   Marginal cross-vein present .... 10.
9. The 1st longitudinal vein turned down into the 2nd, meeting it where it forks; discal cell in the middle of the wing, the anterior cross-vein in the middle of the discal cell .... LECHRIA, Skuse, p. 465.
   The 1st longitudinal vein ending as usual in the costa, clear of the 2nd; discal cell wholly beyond the middle of the wing, the anterior cross-vein at its upper basal corner .... GONOMYIA, Mg., p. 468.
10. Anterior cross-vein absent .... 11.
    Anterior cross-vein present.......... EMPEDA, Os. Sac., p. 475.
11. Discal cell present .... 12.
    Discal cell absent. Three posterior cells; anal cell closed .... MONGOMIOIDES, Brun., [p. 481.
12. Four posterior cells, anal cell closed . . MONGOMA, Westw., p. 476.
    Three posterior cells, anal cell open . . PARAMONGOMA, Brun., [p. 484.
13. The 7th longitudinal vein straight . . 14.
    The 7th longitudinal vein conspicuonsly bisinuate .... SYMPLECTA, Mg., p. 485.
14. Body slender; legs slender, minutely pubescent in normal manner; abdomen not narrowed at base .... GNOPHOMYIA, Os. Sac., [p. 487.
    Body compact, robust (rather resembling *Teucholabis*); legs conspicuously though shortly hairy; abdomen narrowed at base .... DASYMALLOMYIA, Brun., [p. 494.
15. Anterior cross-vein placed at the beginning of, or over the middle of, the discal cell; in the absence of the discal cell, at the base of the 3rd posterior cell .... 16.
    Anterior cross-vein distinctly beyond the distal cell..................... CONOSIA, Wulp, p. 496.
16. Subcostal cross-vein near tip of auxiliary vein. Discal cell present, proximal end rectangular; antennal scape long, normal; flagellum of 14 oval joints .... CLADURA, Os. Sac., p. 499.
    Subcostal cross-vein very far before tip of auxiliary vein, near middle of wing .... 17.

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* In spite of *Styringomyia* having only one submarginal cell, its natural affinity is here, with strong resemblances to *Erioptera*, *Gonomyia* and the curious Australian genus *Lechria*, Skuse.

17. The 1st longitudinal vein ending near tip of wing; discal cell present, its proximal end rectangular; antennal scape very short; flagellum of 15 very elongate joints .... PARACLADURA, Brun., [p. 502.

The 1st longitudinal vein ending at a considerable distance from tip of wing; discal cell absent, its proximal end pointed; antennal scape normal; flagellum of 13 oval joints .... CLADUROIDES, Brun., [p. 505.

Genus **RHYPHOLOPHUS**, *Kol.* (Pl. XI, fig. 20.)

Rhypholophus, Kolenati, Wien. Ent. Monats. iv, p. 393 (1860).
Ilisomya, Rondani, Dipt. Ital. Prod. i, p. 180 (1856).
Ormosia, Rondani, *l. c.*
Dasyptera, Schiner, Wien. Ent. Monats. vii, p. 221 (1863).

GENOTYPE, *Rhypholophus phryganopterus*, Kol.

This genus is closely allied to *Erioptera*, the principal differential character being that the wings are pubescent over the whole surface, instead of only along the veins, as is the case in all the other genera of the *Erioptera* group found in the East. There are two submarginal cells, four posterior cells, and a discal cell, which is open or closed. The antennæ are of sixteen joints, and are of considerable length in the males of some species,* the joints being much elongated, strongly pedicelled and pubescent. A discal cell is present or absent; when the cell is absent it is generally the anterior branch of the 4th longitudinal vein that is forked, the cell being then coalescent with the 3rd posterior cell.† The wing is, generally speaking, slightly broader than in *Erioptera*, and the veins diverge from each other rather more distinctly, so that they do not present the peculiar effect of parallelism so conspicuous in *Erioptera*. The 7th longitudinal vein is normally straight, or slightly arcuate, bending downwards or more or less abruptly curved downwards in its middle, presenting its concavity towards the 6th vein. Occasionally ‡ it runs comparatively near to the 6th vein in its basal part, but never so pronouncedly so as in the typical *Eriopteræ*.

Range. The previously recorded species occur in Europe and North America, extending into the Arctic Regions, several species coming from Greenland and Alaska.

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* This does not occur in the Oriental species.

† These species were placed in the genus, *Dasyptera*, formed for their reception by Schiner, but our more extended acquaintance with the Diptera has proved that the presence or absence of a discal cell is seldom of generic value unless accompanied by other constant characters. It is not always the anterior branch of the 4th vein which is forked, when the discal cell is absent, as in at least one North American species (*R. holotrichus*, Os. Sac.) the posterior branch bears the fork.

‡ *R. nigripilus*, Os. Sac., from North America.

The two Indian species may be recognised as follows:—

Femora with a single apical pale band of golden yellow hairs; wings with black hairs arranged in four more or less obvious broad bands .... *geniculatus*, sp. nov.
Femora with two pale bands, one apical, one subapical; wings without any obvious bands of black hairs .... *pulcher*, sp. nov.

316. **Rhypholophus geniculatus**, sp. nov.

♂. *Head*: vertex and frons very broad, covered with short golden yellow hairs; eyes deeply emarginate; palpi dark brown, considerably pubescent. Antennal scape pale yellow; flagellar joints elongate oval, rather thickly pubescent, with pale brownish yellow hairs, brown, tips pale yellowish white, the joints becoming longer and narrower towards the tips of the antennæ. *Thorax* yellowish, indistinctly darker along the middle, and where the usual shorter dorsal stripes occur; darker also behind the suture; a small shining elongate black spot in a small depression on each side of the middle, a little before half-way between the anterior margin and the suture. Thorax pubescent, with short yellow hairs, and a dorso-central stripe of irregularly placed longer thicker yellow hairs along each side of the middle, well separated. Scutellum with yellowish hairs. *Abdomen* black, with comparatively thick yellow pubescence. Genitalia large, black, the 1st joint of the claspers oval, the remaining appendages apparently small. *Legs*: anterior legs dark brown or black, with short pubescence, which in certain lights appears golden yellow; a moderately broad band of very short golden yellow hair at tips of femora, extending in some cases to the base of the tibiæ; tips of tibiæ with a very narrow similar band; the hind tibiæ changing rapidly before the middle to yellowish, with short distinct yellow pubescence, and the whole of the hind tarsi yellowish, with concolorous pubescence. *Wings* very pale yellowish grey, rather thickly covered with short black hairs, with which are intermixed, in places, short golden yellow ones, there being no distinct stigma, but the yellow hairs are especially prominent in that part of the wing. The black hairs are arranged so that they form four more or less distinct, though not well-defined, bands of about equal width, with a rather narrow interval between each; the first band basal, the fourth apical, the second ending distinctly before the cross-veins, at which latter spot the third begins; the yellow hairs more numerous between the bands of black hairs. Halteres yellow.

Length 3 millim.

Described from four males from Kurseong, 16. iv. 11 (*Annandale*).

Type (and other examples) in the Indian Museum.

317. **Rhypholophus pulcher**, sp. nov. (Pl. VIII, fig. 16.)

♀. *Head* flattened, elongate; eyes very emarginate; vertex, back of head and frons (the latter forming one-third the width of the head) blackish grey, with long ragged brownish yellow hairs. Proboscis moderately long, brownish yellow; palpi dark brown, very pubescent. Antennæ brownish yellow, pubescent; scape normal; flagellum of fourteen oval joints, the base of each joint black. *Thorax*: neck short, brownish yellow. Dorsum of thorax rather dark brown, with three nearly contiguous brown stripes, barely darker than the ground-colour; a narrow pale lemon-yellow collare below the edge of the dorsum. Above the neck and below the collare, rather copious long brownish yellow hairs; two well-separated dorso-central longitudinal bands of short yellow hairs, amongst which some long bristly yellow hairs stand out distinctly; these two rows begin on the anterior margin and converge at the suture, continuing over it to the posterior margin; and from the suture a branch row on each side, of both long and short hairs intermixed, runs to each posterior corner of the dorsum. Scutellum broad, brown, metanotum dark brown, both with a few short yellow hairs. *Abdomen* dark brown, belly similar, both sides with yellow hairs. Ovipositor conspicuous, bright brownish yellow, basal portion large and shining, pubescent; the lower pair of valves shorter, both pairs very shining brownish yellow. *Legs* brownish yellow, trochanters nearly as long as the coxæ; the femora become brown on the apical half and bear two pale rings, one apical, the other subapical; tips of tibiæ and the tarsi darker; legs pubescent. *Wings*: the auxiliary vein ending about opposite the fork of the 2nd longitudinal vein, the 1st vein ending some way beyond this point; the 2nd vein beginning at about one-third of the wing, forking before half its length, the branches nearly parallel distinctly curved upwards at their tips, the marginal cross-vein placed exactly at the fork; the 3rd vein originating a little before the fork of the 2nd, its basal part moderately long, longer than the anterior cross-vein, the remaining portion running straight to the wing-tip; upper branch of 4th longitudinal vein parallel to the 3rd until the tip when it suddenly bends downwards, forked at half its length, the veinlet forming a sharp rectangle, thence being parallel to the upper branch; 1st posterior cell nearly as long as 2nd submarginal cell; lower branch of 4th vein originating just before anterior cross-vein, emerging at an angle from the stem, thence running straight to the hind margin of the wing; posterior cross-vein slightly sinuate, a little before the fork of the 4th vein; 5th and 6th veins gently curved, 7th distinctly bisinuate.* Ground-colour of wing very pale grey, the whole membrane as well as the veins thickly pubescent with short black and yellow hairs intermixed more or less in

* Resembling that of *Symplecta*, except that the tip is not so abruptly curved into the hind margin.

patches ; the black hairs are the thicker on the veins and at the base of the 2nd vein, of the 3rd vein, at the fork of the 2nd vein, over the stigmatic portion of the 1st vein, over the posterior cross-vein, over the lower veinlet of the upper branch of the 4th vein, in the middle of the axillary cell and towards the tip of the costa.

Length 3¼ millim.

Described from the type female taken by Dr. Annandale at Phagu, Simla district, 9000 feet, 11. v. 09, and an additional female taken by the same gentleman at Naini Tal, Kumaon district, 6400 ft., x. 1906.

Type and second specimen in the Indian Museum.

Genus **MOLOPHILUS**, *Curt.*

Molophilus, Curtis, Brit. Entom. p. 444 (1833).
Erioptera, Schiner (*nec* Meigen), Wien. Ent. Monats. vii, p. 221 (1863).

GENOTYPE, *Erioptera atra*, Mg. (*brevipennis*, Curt.).

Molophilus possesses the general characters of *Erioptera*, to which it is intimately akin, and from which the principal separative character is the peculiar but very distinctive one of the *3rd longitudinal vein issuing from the lower branch of the 2nd longitudinal vein*, instead of from the præfurca of that vein, as is usually the case in the ERIOPTERINI. This causes the 1st submarginal cell to be distinctly, though not greatly, longer than the 2nd. The 4th longitudinal vein forks much sooner than in *Erioptera*, much before the anterior cross-vein, the posterior cross-vein being just beyond the fork of the 4th vein. This causes the 2nd posterior cell (as the discal cell is always absent, so far as I am aware) to be much longer than the 1st or the 3rd cell. Marginal cross-vein just beyond the fork of the 2nd vein ; basal section of 3rd vein, and the anterior cross-vein in a line. Posterior branch of the 4th longitudinal forked, the branches long and nearly parallel. The 5th, 6th, and 7th veins nearly straight, the latter long, but without any tendency to approach the 6th nor running parallel to the hind margin of the wing, as is characteristic of the typical Oriental species of *Erioptera*.

Range. Europe, North America, and Australia, in addition to the forms herein described.

This genus was founded by Curtis for what he described as *M. brevipennis*, Curt., but which subsequently was found to be synonymous with *Erioptera atra*, Mg. * Although Osten Sacken disagrees with the generic value of the characters † attributed to

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* Osten Sacken (Monog. Dipt. N. Amer. p. 148) distinctly calls attention to the fact that the synonymy adopted by European authorities must have been based on a comparison with the types, because Curtis's description and that of *E. atra*, Mg., would not lead an independent worker to the opinion of their identity.

† These were, the small size of the wing, the modified shape of the thorax and abdomen, and the large male genitalia.

Molophilus by Curtis, he acquiesces in the retention of the name for the group of species to which *E. atra* belongs, and this view is adopted in recent catalogues.

Table of Species.

Flagellar joints of antennæ short, ovate	*inconspicua*, sp. n.
Flagellar joints of antennæ much elongated .	*assamensis*, sp. n.

318. **Molophilus inconspicua**, sp. nov.

♂ ♀. *Head*: vertex, frons and back of head grey, with pale hairs; the vertex narrowing rapidly into the frons, the width between the eyes above the antennæ about one-third that of the head, but at vertex nearly one-half. Proboscis and palpi dark brown. Scapal joints of antennæ subequal in width, 1st joint the longer, brownish yellow; flagellum of fourteen shortly oval joints, varying from pale yellowish to brownish, with short pubescence. *Thorax* brownish yellow, shining, no distinct stripes, but in some examples the parts of the dorsum usually occupied by the three normal stripes and the dark spots behind the suture are rather more brownish. Two widely separated rows of dorso-central bristly hairs, running from inside the shoulders to the posterior corners; some further bristles are present, above the wings, on the scutellum, irregularly placed, and on the pleuræ, which latter are in some specimens a little darker. Scutellum and sides of thorax brownish yellow; metanotum blackish brown. *Abdomen*: dorsum brown, belly generally yellowish, with rather numerous brownish yellow hairs on both sides. Genitalia of male large and conspicuous, brownish yellow, with long brownish yellow hairs; a dorsal conspicuous oblong plate, the usual pair of claspers, the basal joint of which is thick and conical, the 2nd bearing a narrow horny hook with a black tip; there is also an additional pair of slender black-tipped organs, and an inner pair of claspers. In the female the sexual organ consists of two pairs of yellow-haired, brownish yellow elongate valves, the lower pair shorter, and slightly twisted round to the side, being also set rather further back; the terminal points of both pairs long. *Legs* pale brownish yellow, tips of tarsi darker. *Wings* pale grey. Auxiliary vein ending well beyond the middle of the wing, the 1st longitudinal ending half-way between tip of auxiliary and tip of wing; subcostal vein some distance before tip of auxiliary, between origin of 2nd vein and marginal cross-vein; the 2nd vein beginning distinctly before one-third of the wing, præfurca nearly straight, nearly as long as the two branches, which fork just before the marginal cross-vein, running parallel to the border; the 3rd vein originating opposite the marginal cross-vein, its basal section very short, thence running perfectly straight to the wing-tip; anterior cross-vein short; the 4th vein forking in the middle of the wing, some distance before the anterior cross-vein, the upper branch

single, straight, the lower one forked just beyond the anterior cross-vein; all the veins on distal part of wing approximately parallel; posterior cross-vein placed just after forking of fourth vein, in the middle of the wing; the 5th, 6th and 7th veins nearly straight. All the veins with a thick row of hairs. Halteres yellowish, clubs darker.

Length $1\frac{1}{2}$–2 millim.

Described from several examples of both sexes in the Indian Museum, from Simla, 7000 ft., 12. v. 08 (*Annandale*); Kurseong, 4–6. vii. 08, 18–20. vi. 10 (*type* ♂); Maddathorai, 16. xi. 08 (*type* ♀), and Tenmalai, 22. xi. 08, Travancore, South India, all taken by Dr. Annandale.

319. **Molophilus assamensis**, sp. nov.

♂. *Head*: occiput, proboscis and palpi yellowish, the latter a little darker. Antennæ of considerable size and length; scapal joints very short, rounded; flagellum of fourteen very elongated joints, with long pubescence on each side of every joint except at the base and the tip; the whole antennæ brownish yellow. *Thorax* uniformly brownish yellow, with some long yellow hairs on each side. Scutellum, metanotum and sides of thorax concolorous. *Abdomen* brownish; traces of yellow here and there, especially towards the tip, last segment yellowish; the whole abdomen rather freely covered with black and yellowish hairs. Genital organs large and conspicuous, brownish yellow, very pubescent; consisting of a pair of large claspers, and below these a pair of black, very attenuated, hard, slightly curved, hook-like processes; also two smaller pairs of sub-filamentous appendages. *Legs* uniformly yellow, with close yellow pubescence. *Wings* pale grey, thickly set with long blackish hairs along all the veins and on the borders of the wing. Venation as in *M. inconspicua*. Halteres yellowish, knob darker.

Length $2\frac{1}{4}$ millim.

Described from a unique specimen from Sylhet, 8. i. 06 (*Lt.-Col. Hall*).

Type in the Indian Museum.

Genus **ERIOPTERA**, *Mg.*

Erioptera, Meigen, Illig. Mag. ii, p. 262 (1803).
Chemalida, Rondani, Dipt. Ital. Prod. i, p. 180 (1856).
Limnæa, Rondani, *loc. cit.*, i, p. 180 (1856).
Limnoica, Rondani, *loc. cit.*, Corrigenda, p. 11 (1861).
? *Octavia*, Bigot, Ann. Soc. Ent. France (3) ii, p. 475 (1854).

GENOTYPE, *Erioptera lutea*, Mg.; by designation of Coquillett (1910).

Head: frons distinctly broad, varying from about one-fourth to one-half the width of the head; eyes glabrous, contiguous or

subcontiguous beneath. Proboscis short, stout; palpi comparatively short, the middle joints rather stouter. Antennæ generally rather short,* of sixteen joints; the 1st scapal joint varies in length but is nearly always wider at the tip; the 2nd is considerably enlarged, much the widest of all, rounded, subcylindrical or ovate, occasionally of irregular shape; 1st joint of the flagellum often onion-shaped, and often much larger than the remaining flagellar joints, which are oval, more or less, becoming considerably elongated towards the tip of the antenna, the whole flagellum closely pubescent, each joint bearing a verticel of long hairs. *Thorax* somewhat high and convex, produced forwards conically into a short blunt neck, which is inconspicuous in some species. Two well-separated rows of dorso-central stiff hairs, which, beyond the suture, generally diverge towards the posterior corners of the dorsum.† Thoracic suture distinct, and the post-sutural depression rather well marked. *Abdomen* linear, of moderate size, often transparent, when the internal organs can be rather easily seen. Genitalia of male consisting of a large fleshy basal joint which is usually ovate or subcylindrical, and to which is appended sometimes a single horny hook or bifid claw, sometimes a second joint, much smaller, bearing a terminal hard piece of some kind. Different intermediate small organs appear to be present in some of the species, but they are not easily examined in dried specimens.‡ The ovipositor in the female differs in length considerably; the upper pair of valves long, slightly curved upwards, the lower pair set further back at their base, generally much shorter, and straight, both pairs enlarged, in some species to a considerable extent, at the base; two small horny projections are placed at the base of the upper pair of valves.§ *Legs* slender, of moderate length or rather short, pubescent, often very conspicuously hairy; the middle pair generally shorter than the others; tibiæ without apical spurs, empodia distinct, ungues smooth on the inner side; the last joint of the tarsus is said to project somewhat over the ungues. *Wings* rather broad, tip rounded; veins pubescent, especially towards the apical half of the wing, but the hairs much more conspicuous in some species than in others. Two submarginal cells and four posterior cells, the discal cell open or closed; the veins mainly parallel on the outer side of the wing; the auxiliary vein ending beyond the middle of the wing,

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* Osten Sacken observes that some species have the antennæ in the female long enough to reach to the base of the abdomen, but there are no species with such long antennæ in the East.

† The chætotaxy (if such it can be called, when referring to stiff hairs instead of bristles and spines) has not been observed closely as the above description appears to apply to all the species, in a greater or less degree, of this and its allied genera.

‡ Osten Sacken figures one North American species (*E. armata*, Os. Sac.) in which the large basal joint is terminated by three horny teeth united at thei bases.

§ According to Osten Sacken; but I have not searched for them myself.

sometimes at nearly three-fourths its length ; the 1st longitudinal vein ending some distance beyond the tip of the auxiliary ; the 2nd vein beginning some distance before the middle of the wing, at an acute angle, the first part of the præfurca (that is, up to the origin of the 3rd vein) much longer, often double as long, as the remainder (up to the fork) ; the vein forks soon after the origin of the 3rd vein, the branches more or less parallel, the marginal cross-vein situated just after the fork ; the 3rd vein emerging at a wide angle, the basal section of about the same length as the anterior cross-vein ; the 4th longitudinal forking at or almost immediately before, the anterior cross-vein ; the anterior branch simple, the posterior branch forked soon after quitting the cross-vein, the veinlets sometimes parallel, sometimes diverging, their tips having a tendency to turn upward slightly ; posterior cross-vein lying from a little before to a little after the forking of the 2nd vein ; the 5th and 6th veins nearly straight, the 7th running for a considerable distance close to and parallel with the 6th, and, after turning down to the margin, running (more or less sinuously) parallel with the hind edge of the wing. This character is not invariable, as in some species it is nearly straight, in others, although approximate in its basal half to the 6th, it afterwards turns straight down to the wing margin without running alongside of the latter.

Range. Europe, North Africa, North and South America, West Indies, Java, India and Australia.

In his Monograph (p. 146) Osten Sacken goes very fully into the question of the synonymy of *Erioptera* and the closely allied genera *Rhypholophus*, Kol., *Molophilus*, Curt., *Acyphona*, Os. Sac., and *Mesocyphona*, Os. Sac. He seems to have had grave doubts about admitting to generic rank any of these subsidiary genera except *Molophilus*. Referring to the genus *Erioptera*, which he divided into the following subgenera, *Erioptera*, *Acyphona*, *Hoplolabis*, *Mesocyphona* and *Molophilus*, he says : "If I have retained them in the position of groups or subgenera it is because, in my opinion, the characters which all these species possess in common, constitute between them *a link of affinity more important than the structural differences which some of them show*".* In his later work on the genera of TIPULIDÆ he adheres to this view, with the exception of finally accepting *Molophilus* as distinct, owing to the peculiar origin of the 3rd longitudinal vein from the posterior branch of the 2nd vein instead of from the præfurca, as in most ERIOPTERINI.

Erioptera, as I understand it, is now retained for species in which the 4th longitudinal vein has its *posterior* branch forked, the discal cell open, coalescent with the 2nd posterior cell, and the 7th vein often (though not in all cases) with the peculiar character of running alongside the 6th for some distance, and

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* The italics are mine.—E. B.

then after turning more or less suddenly downwards towards the hind margin of the wing, running approximately alongside of that also, although the apical half of the 7th vein itself in such cases is sinuate or bisinuate.

Mesocyphona differs mainly by the anterior branch of the 4th longitudinal vein being forked instead of the posterior one, so that the discal cell, being absent as such, is coalescent with the 3rd posterior cell. The 7th vein appears to be straight, the only species other than my new one, *M. nigripes*, with which I have the means of comparison, being *M. caloptera*, Os. Sac., of which Needham gives a figure.*

Acyphona and *Hoplolabis*, not being Oriental, may be passed over with the remark that the closing of the discal cell, foreshortening the 2nd posterior cell, is the only generic character of the former, whilst the appendix in the discal cell in addition to the position of the posterior cross-vein (some distance before the discal cell) are the characters of the latter. Of course, either or both these forms, whether they are to be considered good genera or not, may easily occur in the East. *Acyphona* occurs in Central Europe, *Hoplolabis* in the United States.

Molophilus is quite a good genus by virtue of the unusual origin of the 3rd vein, coupled with the extension proximally of both the 2nd posterior cell and the posterior cross-vein.

Rhypholophus is again easily separated from all the above genera by the membrane of the wings being hairy in addition to the veins.

In *Erioptera*, *sensu stricto*, some variation of importance in the course of the 7th vein is recorded above, and those species in which this vein assumes its peculiar and unusual course may be regarded as the typical ones of the genus in the East. In the degree of pubescence of the veins, much difference is seen, some species appearing at once as hairy-winged, whereas in others the wings appear at first sight practically bare.

Table of Species.

1. Wing with distinct spots composed of small patches of black hairs	*punctipennis*, sp. n., p. 449.
Wing without such marks	2.
2. Posterior cross-vein at some little distance before fork of 4th longitudinal vein	*ferruginea*, sp. n., p. 450.
Posterior cross-vein immediately before, or actually at, fork of 4th vein	3.
Posterior cross-vein half-way between fork of 4th longitudinal vein and fork of its lower branch	*distans*, sp. n., p. 451.

* Although technically *M. nigripes* falls into *Mesocyphona*, I cannot help thinking its affinities are not with *M. caloptera* and *M. parva*, Os. Sac., as its general facies seems quite different from that of these two species.

3. The 7th longitudinal vein not closely approximate to 6th at its base ...... 4.
The 7th longitudinal vein closely approximate to 6th at its base .... 5.
4. Dark grey, grey-legged species; wings nearly clear, veins distinct.......... *brevior*, sp. n., p. 452.
Yellowish, yellow-legged species; wings distinctly yellowish, much more pubescent, veins much less distinct .... *incerta*, sp. n., p. 452.
5. Origin of 2nd and 3rd longitudinal veins, with anterior cross-vein, always beyond middle of wing .... 6.
Origin of 2nd and 3rd veins, with anterior cross-vein, distinctly before middle of wing .... *parallela*, sp. n., p. 453.
6. Grey species, at least the body........ 7.
Yellowish species, at least the body .. 8.
7. Brownish grey species, 4–5 mm. long; wings practically clear .... *orientalis*, sp. n., p. 453.
Yellowish species, 3 mm. long; a very slight suffusion along the cross-veins. . *subtincta*, sp. n., p. 455.
8. Halteres all yellow .... *flava*, sp. n., p. 455.
Halteres with yellow stem and blackish knobs .... 9.
9. Larger species, 5 mm. long .... *grandior*, sp. n., p. 456.
Smaller species, $2\frac{1}{2}$–$3\frac{1}{2}$ mm. long...... 10.
10. Genitalia extra large and more complex in male, larger than usual in female. . *genitalis*, sp. n., p. 456.
Genitalia normal in male and female .. *halterata*, sp. n., p. 457.

320. **Erioptera punctipennis**, sp. nov. (Pl. VIII, fig. 17.)

♀. *Head* light brownish yellow; frons one-fourth the width of the head, very convex, clothed with long thick bright yellow hairs. Proboscis and palpi dark brown. Antennal scape dark brown, 1st joint moderately long, 2nd large, distinctly wider; flagellum of fourteen brownish yellow verticillate joints. *Thorax*: dorsum rather bright shining light brownish yellow; no stripes, but with the configuration of the usual pattern slightly delineated by somewhat darker but ill-defined emarginations; a sharp line of demarcation between the dorsum and the sides of the thorax, which latter are pale yellowish, with a brown lateral median irregular stripe. Two well-separated rows of dorso-central black bristly hairs of different sizes, irregularly placed, from the anterior margin to the posterior corners. Scutellum and metanotum brownish yellow, bare. *Abdomen* dark brown; segments distinct, with some pale yellow hairs at the sides. Belly similar. Ovipositor very large and conspicuous, shining brownish yellow, with long brownish yellow hairs; the basal part enlarged, normal in shape; the lower part of the organ, including the valves, is set rather further back, and it is only about two-thirds the length of the upper portion, being in addition twisted round to the side. *Legs* yellowish, with bright golden yellow microscopic pubescence; tips of all the joints

almost imperceptibly black. *Wings* yellowish, with numerous dark brown marks; pubescent along the veins, the hairs normally yellow, especially along the bright yellow costa, but the hairs are black here and there, forming the dark wing-spots. The auxiliary vein and the 1st longitudinal lie so near the costa as to be hardly visible; the 2nd longitudinal vein beginning at one-third the length of the wing, forking beyond the middle, the upper branch forming a rectangle at its origin, both branches running parallel with the margin of the wing; the very short marginal cross-vein placed at the angle in the upper branch; the 3rd longitudinal vein beginning near the middle of the wing, its basal section in a line with the anterior cross-vein, which itself joins the pointed basal end of the 2nd posterior cell; the 3rd vein and the upper branch of the 4th longitudinal exactly parallel; the lower branch of the 4th vein forked just before its middle; posterior cross-vein situated just beyond the middle of the wing, in a line with the anterior cross-vein; the 5th, 6th and 7th veins practically straight. The wing-markings are composed of small patches of black hairs, and are distributed in the following manner:—five small spots on the costa, a 6th being at the tip of the lower branch of the 2nd longitudinal vein; also one at the tip of all the veins posterior to, but not including, the 3rd vein; an elongated spot over the cross-veins and one each over the fork of the 2nd vein, and that of the 4th vein; the 3rd vein, for some distance in its middle, bears black hairs; similar black hair-spots occur here and there with apparently more or less irregularity. Halteres brownish yellow.

Length $2\frac{3}{4}$ millim.

Described from two females taken by Dr. Annandale at Kurseong, 26–27. vi. 10.

Type and second specimen both in the Indian Museum.

Rather easily distinguished from all other species by the black hair-spots giving the wing a spotted appearance.

321. **Erioptera ferruginea**, sp. nov.

♂. *Head*: vertex and upper part of back of head shining light reddish or ferruginous brown; frons, which is rather narrow—less than a third of the width of the head—and lower part of head behind the eyes, yellow; post-ocular orbit silvery white. Antennal scape and base of flagellum yellowish; remainder of flagellum brown. Proboscis yellow, palpi brownish. *Thorax* light ferruginous brown, very shining; dorsum with a narrow black line in the centre, very attenuated towards the anterior margin, which it barely reaches; it also does not continue posteriorly beyond the suture. Some bristly hairs on the dorsum give the appearance of the usual two well-separated rows of dorso-central ones. Scutellum and sides concolorous or a little lighter; metanotum not shining. *Abdomen* bright yellowish, almost ferruginous

brown, with pale yellow hairs at the sides; segments considerably emarginate; belly similar. Genitalia brownish yellow; a large basal stout subovate pubescent joint, with moderately long bifid yellow claws at the tip. *Legs* yellow, tibiæ a little tinged with brown. *Wings* nearly clear, pubescence on the veins very inconspicuous. Venation nearly normal; lower branch of the 4th longitudinal vein forked widely at half its length; posterior cross-vein at some distance before the fork of the 4th vein; the 7th vein short, turning down to the margin of the wing immediately after quitting the proximity of the 6th vein. Halteres yellow, clubs black.

Length 4 millim.

Described from a single male taken by Dr. Annandale at Pallode, near Trivandrum, Travancore State, South India, 15. xi. 08.

Type in the Indian Museum.

This species resembles *E. halterata* in general appearance, especially in the black-clubbed halteres. It is, however, easily distinguished by several apparently good characters: by the inconspicuous pubescence of the veins; the ferruginous shining thorax, lightly though distinctly striped with black; the different position of the posterior cross-vein; the short 7th vein turning down somewhat sharply to the margin instead of running parallel with it for a considerable distance, as in *E. halterata*. Also the fork of the lower branch of the 4th vein is different, lying beyond the middle of the vein, and being widely open, with the veinlets quite straight.

322. Erioptera distans, sp. nov.

♂. *Head* dark grey; frons very broad, three-fourths the width of the head, and with long black hairs. Proboscis, palpi, and antennæ brownish yellow; flagellar joints oval, moderately large and long, distinctly elongate towards the tip. *Thorax*: dorsum wholly blackish, a little greyish below the shoulders and in front; sides dark grey, with a little grey dusting. *Abdomen*: the 1st segment pale dirty yellow, the remainder black. Genitalia somewhat concealed by a pair of large blackish curved plates; yellowish, two-jointed, hairy, with two small filamentous appendages and an upper pair of small brownish yellow subconical organs. *Legs* brown, with much longer pubescence than usual, especially on the femora. *Wings* pale grey; pubescence very inconspicuous but distinctly present. The auxiliary vein ending opposite the beginning of the 3rd vein; the subcostal cross-vein at a little before the tip of the auxiliary vein; the 1st longitudinal vein at its tip, indistinct, where the wing is a little darkened, as through the beginning of a stigma; remainder of venation normal; the lower branch of 4th longitudinal vein forking rather early; the posterior cross-vein half-way between the fork of the 4th vein

and the fork of its lower branch; the 6th vein nearly parallel with the 5th throughout its length; the 7th short, barely curved, running straight to the wing-margin, without any tendency to approximate to the 6th. Halteres yellowish.

Length 3 millim.

Described from a single male taken by Dr. Annandale at Kurseong, 26. vi. 10.

Type in the Indian Museum.

323. **Erioptera brevior**, sp. nov. (Pl. IX, fig. 2.)

♂ ♀. *Head* mainly grey, the frons forming one-third of the width of the head. Proboscis yellowish; palpi brown, pubescent. Antennæ brownish yellow, normally pubescent. *Thorax* brownish grey, tinged with yellowish towards the sides. Two well-separated rows of dorso-central bristly hairs. Scutellum concolorous, metanotum darker. *Abdomen* brown, reddish brown or brownish yellow, with short pale pubescence. Genitalia of the male concolorous, very pubescent, the 1st joint large, oblongo-cylindrical, the 2nd joint represented by a long bifid black claw. Ovipositor of the female with the dorsal side of the basal portion blackish, the upper pair of valves curved, the lower pair straight. *Legs* brownish yellow, tarsi darker. *Wings* yellowish, pubescence of the veins rather inconspicuous. The auxiliary vein ending in the middle of the wing, the 1st longitudinal at three-fourths of the wing; the 2nd longitudinal vein beginning a little before the middle of the wing, the præfurca being nearly two-thirds the length of the vein; the marginal cross-vein placed at some distance before the rather widely open fork; the 3rd vein originating at the middle of the præfurca, its basal section distinct, nearly as long as the anterior cross-vein; the 3rd vein and the upper branch of the 4th longitudinal are parallel; the basal end of the 2nd posterior cell pointed; the lower branch of the 4th longitudinal forked at one-third of its length, making the 3rd posterior cell elongate-triangular; posterior cross-vein placed immediately before the branching of the 4th vein; the 5th, 6th and 7th veins nearly straight. Halteres pale lemon-yellow.

Length 2 millim.

Described from two males and two females. The *type* male and female taken by Mr. Paiva at Darjiling, 11. viii. 09 and 5.viii.09, respectively. An additional male and female from Kurseong, 7. ix. 09, taken by Dr. Annandale.

Types in the Indian Museum.

324. **Erioptera incerta**, sp. nov.

♂. Very like *E. flava*, but apparently quite distinct. The head is dark grey, not yellowish, the vertex much broader than in *E. flava*; the flagellum of the antennæ is much longer and stronger,

the colour of the thorax and abdomen is darker and more brownish especially the abdomen, and the pale yellow hairs are more numerous; the thoracic dorsum has two distinct rows of long yellow dorso-central hairs. The genitalia are a little more elongate. The wing has the 7th vein *not approximate* to the 6th near the base, but in length it is equal to that of *E. flava*.

Length 2 millim.

Described from a single male taken by Mr. Paiva at Darjiling, 5. viii. 09.

Type in the Indian Museum.

325. **Erioptera parallela**, sp. nov.

♀. *Head* yellowish grey; frons one-fourth the width of the head, with a few hairs. Proboscis and palpi brownish yellow. Antennæ rather long; 1st scapal joint rather short, 2nd large, 1st flagellar joint oval, as are the rest, but slightly larger. *Thorax* dirty brownish yellow, pubescence inconspicuous. *Abdomen* blackish. Ovipositor rather small, dark brownish yellow, shining, the terminal blades short, yellowish. *Legs* brownish, the coxæ brownish yellow. *Wings* pale grey, veins all distinctly pubescent. The 2nd longitudinal vein beginning at one-fourth of the wing, forking just beyond the middle; the 3rd vein originating just before the middle of the wing; the anterior cross-vein barely beyond the middle; the 4th vein forking immediately before the anterior cross-vein, the posterior cross-vein placed immediately before the fork; the lower branch of the 4th vein forking early; all these veins practically parallel, and from their extra length, due to the cross-veins being so near the middle of the wing, the appearance of parallelism is striking; the 7th vein running exceedingly close to the 6th vein at the base (the 5th and 6th veins are stronger than usual, and distinctly united at their bases), and afterwards running nearly parallel with the wing-margin, at some distance from it, whilst still remaining more or less parallel to the 6th vein; the 5th, 6th, and 7th veins all seem rather closer together in this species than in others. Halteres rather large, with narrow yellow stems and black clubs.

Length about 3 millim.

Described from a single female from Kurseong, June 1910.

Type in the Indian Museum.

Since describing this species the abdomen has become detached and lost. No other specimen has been seen.

326. **Erioptera orientalis**, sp. nov.

♂ ♀. *Head*: vertex, back of head, and the very broad frons (the latter much elevated and measuring four-fifths the width of the head—possibly sometimes less than this) moderately dark grey, with long and short black hairs. The frons by its elevation affords

the peculiar appearance of the vertex being drawn forward, as it were, into a pointed flap, which hangs down between the eyes; the sides of the frons, near the eyes, being bent inwards; the occiput, near the eye-margins, is whitish. Proboscis yellow, with large yellow labella at tip; palpi dark brown. Antennal scape with the 1st joint long, cylindrical, yellowish; 2nd broader and shorter, rounded, a little greyish; the flagellum with lighter brownish yellow, elongate, oval joints; distinctly pubescent, with hairs of different lengths and a verticel of a few much longer hairs on each joint. *Thorax* dull greyish brown; a little yellowish about the pleuræ, on the shoulders and on the broad post-sutural depression; no distinct dorsal stripes, but there is in some specimens an ill-defined indication of them. Scutellum and metanotum more or less concolorous, the whole posterior part of the thorax generally more yellowish than the anterior half. *Abdomen* brownish or brownish yellow, hind margins and sides of segments often blackish. Some soft yellow hairs over dorsum and sides. Genitalia of the male consisting of a pair of elongated cylindrical claspers, of one joint only, with a small black terminal hook which appears to represent all there is of the second joint. Ovipositor of female brownish yellow, normal in shape, small. *Legs* brownish yellow, trochanters nearly as long as the coxæ, femora with a blackish subapical ring. *Wings* yellowish grey. The auxiliary vein lying very close to the 1st longitudinal and ending in the costa opposite the marginal cross-vein, the 1st vein ending half-way between the marginal cross-vein and the tip of the wing; the 2nd longitudinal vein beginning much before the middle of the wing, at a comparatively small angle, and forking just before the marginal cross-vein, the branches being parallel and the præfurca being half the length of the vein; the 3rd vein originating a little before the fork of the 2nd, forming a distinct angle at its bend, thence running parallel with the lower branch of the 2nd vein straight to the wing-tip; anterior cross-vein moderately long, in a line with the basal section of the 3rd vein; the 4th vein forking almost exactly by the anterior cross-vein, thus forming a short basal side to the 2nd posterior cell (the discal cell being absent); the upper branch of the 4th vein straight, simple, nearly parallel with the 3rd vein, the 1st posterior cell being slightly narrow at the tip; the lower branch widely forked at half its length; the posterior cross-vein placed just before the fork of the 4th vein; the 5th and 6th veins nearly straight; the 7th, after quitting the 6th, takes a moderately wide curve and, towards the tip, again turns downwards to the margin. The hairs on all the veins very small and quite inconspicuous. Halteres yellowish.

Length 4-5 millim.

Described from three males and six females in the Indian Museum from Darjiling, 5. viii. 09, including *type* male (*Paiva*), also *type* female and other specimens (*Annandale*); Kurseong, 4-9. ix. 09; and Shanghai, South China, 8. v. 26 (*Brunetti*).

Types in the Indian Museum.

327. **Eriopterа subtincta**, sp. nov.

♂ ♀. *Head* yellowish; frons about one-third the width of the head, with some bristles. Proboscis yellowish; palpi dark brown. Antennæ brownish yellow, the scapal joints of considerable size, comparatively, especially the 2nd; the basal flagellar joint is also much larger than the others. In the female the colour of the flagellum is darker brown. *Thorax* almost uniformly brownish yellow, with apparently two somewhat irregular rows of dorso-central small bristly hairs. Scutellum more or less uniform in colour, metanotum darker; the pleuræ as well as the metanotum with more or less of a light violet tinge, when viewed from certain directions, and with a little white dusting. *Abdomen* brownish yellow, with pale hairs; darker in the female. Genitalia of male small and inconspicuous, yellowish. Ovipositor of female yellowish, rather larger at the base, the terminal valves yellow. *Legs*: coxæ and femora yellow, tibiæ and tarsi brownish yellow. *Wings* yellowish, venation normal, veins distinctly pubescent. A very slight and narrow suffusion over the cross-veins from the marginal cross-vein to the end of the posterior cross-vein, also very slightly but distinctly over the base of the 2nd longitudinal vein. The 7th vein bisinuate on its apical half. Halteres yellowish, clubs black.

Length 3 millim.

Described from a single male and female from Darjiling. 5. viii. 09 (*Paiva*).

Types in the Indian Museum.

328. **Eriopterа flava**, sp. nov.

♂ ♀. *Head* yellowish or brownish yellow; frons one-third the width of the head, with stiff black hairs. Proboscis short and thick, brownish yellow; palpi dark brown. Antennal scape very large, brownish yellow; flagellum thin, short, paler yellow, 1st joint rather larger than the rest; the joints with very short pubescence and verticels. *Thorax* wholly brownish yellow; some few stiff hairs more or less arranged in two rows. Scutellum, metanotum and sides concolorous. *Abdomen* yellowish, with pale yellow hair at the sides; belly similar. Genitalia moderately large, yellowish, with long bristly hairs; a large ovate basal joint, with a black hook at the end, is all that is visible. *Legs* wholly yellowish; tips of tarsi blackish. *Wings* pale yellowish grey; venation normal, pubescence distinct. The 7th vein long, nearly as long as the 6th, running close alongside the 6th on its basal portion and nearly parallel with the hind margin on its apical portion. Halteres yellowish.

Length $2\frac{1}{2}$–$3\frac{1}{2}$ millim.

Described from three males and one female. The *type* male taken at Madhupur, Bengal, 17. x. 09, "at light" (*Paiva*); the other two males at Bologhatta, near Khulna, Ganges delta on

board a launch "at light," 28. viii. 09 (*Dr. J. T. Jenkins*); the female taken "at light" in Calcutta, 12. ix. 07 (*Annandale*).

Types in the Indian Museum.

The single female present, which I take to be that of this species, is rather larger than the males, the abdomen is a little darker, the antennæ distinctly longer; the genital organs are normal and yellowish.

329. **Erioptera grandior**, sp. nov. (Pl. VIII, fig. 18.)

♀. *Head* yellowish, with numerous bristly black hairs; frons nearly half the width of the head. Proboscis short, thick, brownish yellow; palpi blackish, the 4th joint long, apparently narrowed somewhat in the middle, giving the appearance of a 5th joint. Antennæ brownish yellow, the scapal joints rather large, the flagellar joints oval, but becoming gradually much more elongated towards the tips. *Thorax*: anterior part rather large, but no apparent neck. Ground-colour of thorax light brownish yellow, the dorsum being only slightly darker; a narrow black streak on the prothorax. Two rows of dorso-central bristly hairs, comparatively small in size, as in most of the other species. Scutellum and the rather large metanotum concolorous; pleuræ with a little white dusting. *Abdomen* yellowish, the segments distinctly emarginate, with rather dense, moderately long, soft pale yellow hairs. A narrow black line towards the sides of the segments. Ovipositor brownish yellow, somewhat swollen at the base, the upper pair of valves curved, long, the lower pair shorter and straight. *Legs* wholly brownish yellow, tarsi practically no darker. *Wings* pale yellow, venation normal, veins distinctly pubescent. The 7th longitudinal vein very distinctly bisinuate after quitting its proximity to the 6th. Halteres yellowish, clubs black.

Length 5 millim.

Described from a single female from Simla, 10. v. 09 (*Annandale*).

Type in the Indian Museum.

330. **Erioptera genitalis**, sp. nov.

♂ ♀. *Head*: vertex very broad, yellowish grey with numerous yellow hairs, narrowing to a very narrow frons. Proboscis and palpi dark brown; antennæ brownish yellow. *Thorax* light brownish yellow, pale yellowish grey at the margins and on the shoulders. Two widely separated rows of yellow bristly hairs on the dorsum. *Abdomen* dark brown, more or less marked with yellow, and rather thickly pubescent, with bright yellow hairs. Genitalia extraordinarily large and very complex in the male; a comparatively small dorsal hairy plate; the first joint of the claspers large and thick, bearing dense yellow pubescence and having three obtuse ends, pointing respectively above, below, and behind; from the lower end, which is invaginated, forming a

small cup, projects the 2nd joint, which is moderately long, cylindrical, yellow, with a slightly arcuated short black hook; between the claspers or perhaps issuing from their inner side, are four yellow tentacles (two to each clasper), apparently flexible, one pair of which bears black hooked tips. Ovipositor of the female large, yellow. *Legs* brownish yellow, sometimes quite bright yellow on femora and tibiæ. *Wings* practically clear, highly iridescent; venation normal, the veins thickly clothed with yellow hairs. Halteres very narrow and thin, stem pale yellow, knobs black.

Length 2½-3 millim.

Described from three males and one female from Bhowali, 5700 feet, Kumaon (*A. D. Imms*); the *type* and two other males taken "at light," 27. vi. 10; the *type* female, 12. vi. 10.

Types in the Indian Museum.

331. **Erioptera halterata**, sp. nov.

♂ ♀. *Head*: frons yellowish grey or yellowish, from one-third to one-fourth the width of the head. Proboscis brownish yellow; palpi blackish. Antennæ brownish yellow, normal in length, shape and pubescence, sometimes the apical half of the flagellum a little darker. *Thorax* wholly yellowish, the dorsum almost imperceptibly darker, with two irregular rows of dorso-central bristly hairs. Scutellum and sides of thorax yellowish, metanotum sometimes a little brownish. *Abdomen* brownish yellow, with rather numerous pale yellow hairs at the sides. In some specimens there is a blackish streak towards the sides; in others the narrow internal organs can be readily seen showing black and twisted through the transparent integument. Belly similar. Genitalia of male brownish yellow, pubescent; 1st joint large, subcylindrical; 2nd joint short, with a long bifid claw. Ovipositor brownish yellow, normal, only moderately enlarged at the base; terminal blades long, slightly curved. *Legs* pale yellow, tarsi generally no darker, but in some specimens almost imperceptibly so towards the tips. *Wings* yellow, pubescence of veins distinct, venation nearly normal; the posterior branch of the 4th longitudinal vein forks early, the veinlets both gently bisinuate (which is a slight deviation from their usual course in this genus) and approximately in the same direction; the 7th vein, after quitting its proximity to the 6th, runs practically parallel, though gently bisinuate, with the hind margin of the wing. Halteres yellow, the clubs quite black.

Length 2½–3½ millim.

Described from a *type* male taken by me "at light" at Darjiling, 20. ix. 08; a *type* female from the same place taken by Mr. Paiva, 6–11. viii. 09; and other specimens of both sexes of the same locality and dates.

Types in the Indian Museum.

A male in the above collection, also taken by me at Darjiling, 1.x.08, has the dorsum of the thorax darker, with the margin rather paler yellow. There is a black spot on the frons and the abdomen is dark brown; nevertheless, it would be unwise, at present, to regard it as distinct.

Genus MESOCYPHONA, *Os. Sac.*

Mesocyphona, Osten Sacken, Monog. Dipt. N. Amer. iv, p. 152 (1869).

Genotype, *Erioptera caloptera*, Say, by present designation, being the first of the two species placed by Osten Sacken in the genus at its installation.

The author separates this genus (which he always regarded as a subgenus only) from *Erioptera* as follows:—"The *anterior* branch of the 4th longitudinal vein is forked; in other words, when the discal cell is open it coalesces with the 3rd posterior cell; when the discal cell is closed, the inner ends of the 2nd and 3rd posterior cells are nearly in a line."

The 7th longitudinal vein is straight, and not approximate to the 6th towards the base, nor more or less parallel with the hind margin of the wing in its apical section, as is the case in the typical Oriental species of *Erioptera*. In commenting upon the two North American species on which he founds the genus,* Osten Sacken notes their further resemblance in the position of the two brown stripes on the thorax and in the dark bands on the whitish femora. These characters, however, do not occur in the new species, *M. nigripes*, here added to the genus. (See footnote, p. 448.)

332. Mesocyphona nigripes, sp. nov. (Pl. IX, fig. 1.)

♂. *Head* moderately dark grey; frons forming one-third the width of the head at a little above the antennæ, but rapidly widening towards the vertex, where it forms half the width of the head; colour grey, with rather long stiff black hairs; back of head dark grey, with moderately long black hairs. Proboscis brownish yellow; palpi blackish, comparatively large. Antennæ with the 1st scapal joint long, cylindrical, the 2nd subcylindrical, both blackish; the flagellar joints oval towards the base, the middle and apical ones considerably elongated, each with a verticel of very long hairs in addition to the short ordinary pubescence. *Thorax* very arched, making the height, seen in profile, much greater than usual. Dorsum black, narrowly edged with yellow, this colour

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* *M. caloptera*, Say, and *M. parva*, Os. Sac.

extending a little on to the shoulders. Scutellum more or less yellowish; metanotum black. Sides of thorax almost wholly black. *Abdomen* blackish, roughened, with very sparse short pale hairs; belly black. Genitalia very small, black, consisting, so far as can be seen, of an upper and a lower pair of fleshy subcylindrical one-jointed claspers, no terminal hooks being evident; moderately pubescent. *Legs* black, shortly pubescent. *Wings* pale grey, veins black, pubescence on the veins distinct but not conspicuous. The auxiliary vein ending much beyond the base of the 2nd longitudinal vein, nearly opposite the base of the 3rd vein; the 2nd vein beginning before the middle of the wing, forking beyond half its length, the lower branch nearly twice as long as the upper one; the 1st longitudinal vein ending beyond the fork of the 2nd vein; the 3rd vein beginning at two-thirds of the length of the præfurca, its basal section being half as long as the anterior cross-vein, running to the tip of the wing; the 4th vein has its anterior branch forked at one-third of its length, the branches nearly parallel, so that the 1st posterior cell has its sides also approximately parallel; the 3rd posterior cell with a distinct basal side, the posterior cross-vein in a line with it; the 5th and 6th veins nearly straight; the 7th not approximated to the 6th at any portion of its length, and gently arcuate. Halteres dirty yellowish white.

Length 4½ millim.

Described from two males from Kurseong, 7–9. ix. 09 (*Annandale*), and Ghoom, 7500 ft., 19. ix. 08.

Type and other specimens in the Indian Museum.

Genus STYRINGOMYIA, *Lw.*

Styringomyia, Loew, Dipt. Beitr. I, in "Zu der offentlichen Prufung der Schuler d. Konigl. Fried. Wilh. Gymn. zu Posen," p. 6 (1845).

Genotype, *S. venusta*, Lw.; by original designation. Though this is a fossil species, it is actually the original type of the genus. Further extinct species in amber, from Caffraria, were described by Osten Sacken but not named.

Head: eyes separated above by a broad frons, nearly contiguous below. Proboscis short; palpi four-jointed, the joints more or less of equal length, generally the 1st joint the shortest and the last the longest. Antennæ rather long, 16-jointed; scape with 1st joint elongate, cylindrical, the 2nd broader and much shorter; the flagellum of fourteen oval joints, gradually diminishing in size to the tip. *Thorax* oval, moderately arched; prothorax conically produced into a normal short neck. *Abdomen* long (sometimes three times the length of the thorax), linear, composed of only *seven* segments, a short basal one and six others about equal in

length. Genital organs of male prominent and complex; a large pair of thick fleshy claspers with some appendages, and a secondary pair of claspers. In the female the genital organs are also large and rather more complex than usual. *Legs* comparatively short and stout, rather conspicuously hairy; tibiæ without apical spurs; empodia distinct. *Wings*: *auxiliary vein absent*, probably united with the basal part of 1st longitudinal vein where the latter is slightly thickened and takes a sharp bend downwards, afterwards ending in the costa before the middle of the wing; 2nd vein emerging from towards tip of 1st and forming a wide sweep, or the apical part is turned up rather suddenly to the costa, ending in it about half-way between the tip of the 1st vein and the wing-tip; 3rd vein originating at two-thirds the length of the 2nd and, after the usual bend, running straight to above the wing-tip; anterior cross-vein of moderate length, in a line with the basal section of the 3rd; discal cell approximately oblong, twice as long as broad; upper branch of 4th vein forked at or immediately beyond discal cell, the veinlets diverging, lower branch simple; posterior cross-vein at middle of discal cell; 5th, 6th and 7th veins all long and nearly straight. Through the absence of the auxiliary vein there is a cell less than usual in the anterior part of the wing, those present being the costal, marginal, and sub-marginal (one only) with four posterior cells.

Range. Hawaii, Java, India, Ceylon, and Tropical Africa. Fossil species in amber from Zanzibar and Caffraria.

The genus was described by Loew in 1845 from a specimen in amber, and was for many years considered an extinct genus. The late Baron Osten Sacken, in his Monograph of the North American TIPULIDÆ BREVIPALPI (p. 102), describes a second species (without naming it) from a piece of copal from Zanzibar. He figures a wing, copied from Loew's figure, and characterises the genus, adding from Loew's original description such details as were not distinctly visible in his own species. He suggested, but did not assume, the relationship of the genus to *Toxorhina*. Later on (1887) the same author, in his historical "Studies on Tipulidæ," ii (Berl. Ent. Zeits., xxxiii, p. 185), records the existence of recently captured specimens from Caffraria taken by Wahlberg, in the collection of the Stockholm Museum. Needham (New York State Museum, Bulletin 124, pl. xxvi, fig. 6) reproduces an enlarged figure of Osten Sacken's copy of Loew's wing. Prof. Kertész in his exhaustive catalogue of the Diptera of the World, now in progress of publication, does not mention the genus, from which I presume that the Caffraria specimens were not named. Loew's original species was *S. venusta*, ♀.

Incidentally it may be noted that there exists another genus with a very similar name—*Steringomyia*, Pokorny—erected in 1889 (Verh. zool-bot. Ges. Wien, xxxix, p. 568) for a single species from the Alps, allied to the genus of MUSCIDÆ, *Cynomyia*, Rob. Desv.

De Meijere places the genus in the RHAMPHIDIINI, but it seems to me much more nearly related to the *Gonomyia* group, with *Mongoma*, *Lechria*, and the closer allies of *Gonomyia*.

Table of Species.

Wings with small pale grey infuscations on the cross-veins and elsewhere	*ceylonica*, Edw., p. 461.
Wings quite clear.	
Brown species, wings pale grey..........	*obscura*, Brun., p. 463.
Yellowish species, wings pale yellow	*flava*, Brun., p. 464.

333. **Styringomyia ceylonica**, *Edw.* (Pl. IX, fig. 3; Pl. XI, fig. 18.)

Styringomyia ceylonica, Edwards, Ann. Mag. Nat. Hist. (8) viii, p. 62 (July 1911); Brunetti, Rec. Ind. Mus. vi, p. 298 (1911).

♂ ♀. *Head* and the rather short blunt proboscis, yellowish; the wide frons bearing several long strong bristly hairs. Eyes black, almost contiguous below the head, for a short space. Antennæ yellowish, with somewhat sparse, moderately long hairs; scape brown, 1st joint elongate, 2nd wider at tip; flagellum of fourteen oval joints, narrowing in size towards tip. Palpi yellowish, with some hairs, 4-jointed, each of about the same length, the 1st rather the shortest, the 4th slightly the longest, with a blackish tip which is sometimes bent at a right angle; 2nd broadest and widening towards tip, which is black. *Thorax*: neck moderately long, with strong stiff black hairs on upperside. Thorax brownish on upper half, yellowish below, with two irregular rows of short bristly hairs, separated by a rather wide median space. Some stiff hairs on the sides, a long one on each posterior callus and two in each humeral region. Scutellum and metanotum brown, bare. *Abdomen* about three times as long as the thorax, linear, consisting of the usual short basal segment, and six other longer ones of about equal length, moderately pubescent. Variable in colour; in male mainly dirty yellow with posterior borders of segments a little blackish, or with an indistinct dorsal stripe; in female dark brown. Genital organs of male prominent and highly complicated, consisting of two large basal segments (wider than the terminal abdominal segment), the 2nd pointed posteriorly above; this latter segment bearing a pair of large subchitinous claspers of which the upper arm is bluntly conical, terminating in a black sharp elongated point; the lower arm being attenuated, elongated, nearly transparent, apparently flexible and terminating in a very long black filamentous bristle; below this upper pair of large claspers is a second, much smaller pair, the upper arm of each being bifid and stout, the lower arm longer, comparatively thin, and ending in a small expansion bearing four blunt strong teeth, there being two small black

spines at the middle of this lower arm; between this lower pair of claspers is a small bristly organ, apparently the penis, and below all the organs is a rather large ventral plate. In the female the genitalia are also large and complicated, consisting of a pair of nearly perpendicular sheaths, terminating in filamentous points, and enclosing two internal lamellæ and two bristly fleshy organs, the whole being supported below by a ventral plate which possesses a small appendage towards the tip, below. In both sexes the genital organs are conspicuous and large, generally concolorous or a little lighter in colour than the abdomen. *Legs* mainly yellow, with black rings, pubescent; coxæ rather strong; trochanters rather well developed, half as long as the coxæ: fore coxæ with some strong bristly hairs on the upperside: all coxæ with scattered short hairs; fore femora with a few long hairs (longer than the general pubescence): middle femora with an irregular row of short bristly hairs on upper and anterior sides, including several rather longer ones placed near together towards the tip of the anterior side: hind femora with four rows (one on each side, also above and below) of long soft hairs: all the femora distinctly broader at tip than at base; fore tibæ with a row of five or six long equidistant bristly hairs on the front side, and a row on the outer side: middle tibiæ with a row of five or six bristly hairs on hinder side, and a row of five or six on outer side: hind tibiæ with a row of ten or twelve stronger stiff hairs on hinder side, and a row of five or six stiff long hairs on outer side, in addition to rows of longer, soft hairs, which are also in addition to the general pubescence. All the tarsi with some longer hairs; hind metatarsus, which is as long as the rest of the tarsus, with a row of five or six pairs of diverging bristly hairs on outer side; 2nd, 3rd and 4th tarsal joints with some longer hairs in sets of from two to four, on outer sides; claws black. In coloration, all the femora have two blackish rings on the apical half, the tips also being narrowly black; the tibiæ have a narrow ring in the middle and a rather broad one at the tip; all the tarsal joints are black-tipped; all these rings on the legs being variable in width and still more so in intensity. *Wings* clear grey; considerably iridescent; costa very shortly bristly, quite bare at base; posterior margin of wing with soft short hairs, longest at base of wing and shortest towards tip of wing. 1st longitudinal vein with a row of distinct, rather long bristly hairs throughout its entire length, deflected suddenly downwards near its base, shortly afterwards merged in the costa, just after the origin of the 2nd longitudinal, which, distinctly before half the distance from its origin to the wing-tip, turns up almost at right angles to the costa; the 3rd longitudinal springing from the small cross-vein, nearly straight; the upper branch of the 4th vein forked, the two prongs slightly divergent near base and at tip; discal cell rhomboidal, twice as long as broad, rather broader at apical end; posterior cross-vein exactly below middle of discal cell; the 5th and 6th longitudinal veins nearly straight, 7th

bristly at the base, rather more than half as long as the 6th, sharply curved near its tip towards the border. A slight brownish suffusion over the anterior cross-vein, the outer side of the discal cell, and the posterior cross-vein. Halteres dirty yellow; knobs blackish.

Length 3–6 millim.

Originally described by Mr. Edwards from a single male from Weligama, Ceylon, 9.ii.08 (*T. Bainbrigge Fletcher*); here redescribed from a pair in the Indian Museum taken *in cop.* at Sukhwani, Nepal, 15.–16.ii.08; a pair *in cop.* from Puri, Orissa, 10.xi.10 (*Annandale*); a pair *in cop.* taken at light 30.vii.10 (*Gravely*); a pair taken at Sukna, Darjiling district, 500 ft., 1.vii.08 (*Annandale*); and from other specimens.

Type ♂ in the British Museum.

The above description was written some months before the publication of Mr. Edwards' *S. ceylonica*, under the assumption that it was a new species, having been drawn up from a series of more than a dozen specimens representing both sexes. The species shows considerable variation, and a form which I had intended to describe as a variety has the wings more yellowish, the veins paler and the tip of each one very slightly but distinctly darkened at the wing-margin. In the Indian Museum are one male and three females from Sukna, 500 ft., 1.vii.08, Puri, Orissa, 22.x.08 (both *Annandale*), and Calcutta, 9.xii.07. I took it at first for a "plains" variety of my supposed new species, but intermediate individuals connect it with the typical form. Dr. Annandale says it rests with its anterior legs stretched out flat in front and its hind legs behind.

The precise mathematical distinctions appertaining to the bands on the legs, as given by Mr. Edwards do not hold good, as they exhibit considerable variation. The "bristly hairs" mentioned in the above description are sometimes (especially those on the neck, shoulders and pleuræ) sufficiently strong to be termed real bristles.

334. Styringomyia obscura, *Brun.*

Styringomyia obscura, Brunetti, Rec. Ind. Mus. vi, p. 300 (1911).

♂. *Head*: frons brownish yellow, antennal scape dark brown; flagellum (of fourteen oval joints) yellowish, pubescent; palpi dark brown, pubescent; proboscis brown; back of head light reddish brown, with some bristly hairs. *Thorax*: neck (with strong bristles), dorsum of thorax, scutellum and metanotum uniformly dark brown; traces, on hinder part of dorsum, of a pale median line, extending over the scutellum and metanotum. Two rows of dorsal bristles as in *S. ceylonica*, and a few bristly hairs above and in front of the wings. Sides and lower part of thorax brownish yellow. *Abdomen* moderately dark brown, minutely pubescent,

blackish towards tip, emargination of segments black; belly concolorous. Genital organs conspicuous and large, consisting of a rather large upper part, with two small terminal lamellæ bearing long hairs; a pair of large fleshy claspers and a pubescent ventral plate, bilobed at tip. *Legs* (middle pair wanting): coxæ and trochanters reddish yellow, with some black hairs on anterior pairs, and yellow hairs on hind pair. Femora (fore pair distinctly but not greatly, thickened towards the tip) yellow; apical fourth black, and with a black ring in the middle which is very wide on the fore pair and moderately wide on the hind pair. Tibiæ blackish brown, pale at extreme base. Fore tarsi blackish brown, hind pair yellowish white, claws black, apart from the minute pubescence of the whole legs. The only stiff hairs are a row of weak ones on the outside of the hind tibiæ, and on the lower side of the hind tarsi; a few stiffer hairs on fore tibiæ. *Wings* grey, unmarked; venation as in *S. ceylonica*, but the veins dark brown and much more distinct. Halteres black, stem brownish yellow.

Length 5 millim.

Described from a single male in the Indian Museum from Thamaspur, Nepal, base of Himalayas, 18–20. ii. 08.

335. Styringomyia flava, *Brun.*

Styringomyia flava, Brunetti, Rec. Ind. Mus. vi, p. 301 (1911).

♂. Whole body mainly pale dirty yellow. *Head*: 1st joint of scape dark brown on underside; flagellum of fourteen joints, more elongated than in the other species. *Thorax*: a strong long spiny bristly hair just above the wing, four small dorso-central ones arranged in a curve, two long ones on the scutellum and a large one on each shoulder; also a strong one a little below each wing; pleuræ with some minute stiff hairs. *Abdomen* with rather longer soft pubescence; posterior margins of abdominal segments with a moderately wide brown band, interrupted in the middle. Genitalia concolorous, conspicuous; a pair of large pubescent fleshy claspers, each bearing at its end a long, filamentous semitransparent tentacle and three strong black spines; on the inside of each clasper is a slightly prominent comb-like organ and also possibly a pair of lamellæ; above, and almost between these large claspers a smaller fleshy projecting pubescent organ; below all, an onion-shaped ventral plate, which, as well as the whole genitalia, is covered with long bristly hairs. *Legs* pale yellow, minutely pubescent, especially on the tibiæ; coxæ with stiff hairs; femora with a faint trace of the two apical black rings as in *S. ceylonica*, fore pair barely enlarged at tip, with a row on upper and undersides of longer, stiff hairs: posterior femora with rows of stiff hairs, mainly on upper and outer sides, but with a tendency to general distribution, especially on hind pair. Fore tibiæ with some bristly hairs on front side and a double row of more numerous

ones on outer side; posterior tibiæ with bristles on outer and hinder sides. Tarsi with a few bristly hairs below. *Wings* distinctly pale yellow, very iridescent, quite unmarked; venation exactly as in *S. ceylonica*, and the costa with a distinct fringe of short bristly pale hairs, which are nearly absent at the base, both on front and hind margins. Halteres pale dirty yellow.

Length 5 millim.

Described from a single male taken at light, 22. xi. 08, at Tenmalai, Travancore State, South India (*Annandale*).

Type in the Indian Museum.

Genus LECHRIA, *Skuse*.

Lechria, Skuse, Proc. Linn. Soc. N. S. Wales (2) iv, p. 830 (1890).

GENOTYPE, *L. singularis*, Skuse; by original designation.

"Two submarginal cells, the first very short, sub-triangular; four posterior cells; no marginal cross-vein, but inner marginal cell closed by first longitudinal vein, which ends at inner end of first submarginal cell; small cross-vein situated some distance before inner end of second submarginal cell; præfurca originating beyond the middle of the wing; discal cell closed, elongated, its inner half cuneate, and its inner end situated before origin of præfurca; wings glabrous. Antennæ 16-jointed, short. Feet long, slender; tibiæ with spurs; ungues small, smooth; empodia indistinct. Male forceps with two horny appendages; an outer linear one, and a longer somewhat hooked inner appendage; also five long, horny, needle-like processes of the internal apparatus. Rostrum nearly half the length of the head; palpi of moderate length, the first joint apparently slightly the longest, the last three rather thicker, equal. The antennæ little longer (if any) than the head; joints of scapus somewhat thick, subcylindrical, the first rather longer than the second; flagellar joints subcylindrical, with very short hairs. Eyes contiguous above, and almost so on the underside. Collare inconspicuous. Legs clothed with only a microscopic pubescence. Wings very cuneiformly narrowed towards the base, with only a slight anal angle; covered with microscopic dots, visible only under a high power; the veins at apical end of wings densely beset with minute hairs; stigma narrow, elongate, enveloping terminal portion of first longitudinal vein. The tip of auxiliary vein is opposite the end of the præfurca and the small cross-vein; the subcostal cross-vein at its tip; præfurca very short, originating at an angle; the first longitudinal gently arcuated into the second longitudinal, joining at the base of its fork; the first submarginal cell is very short; the anterior branch of the second longitudinal fork about half the length of the posterior, the latter converges towards the tip of the third

longitudinal, and is equal in length to the petiole; second submarginal cell also with a short petiole; the small cross-vein situated a little beyond middle of discal cell; the latter closed, elongated, its inner half cuneiformly narrowed, and its inner end a little before the origin of præfurca; the great cross-vein a short distance beyond inner end of discal cell; fourth longitudinal vein originating in fifth longitudinal at a little before one-third the length of the wing, joined at its base to first longitudinal by a short cross-vein; fifth, sixth, and seventh longitudinal veins straight.

"The most striking peculiarities in the venation are, the course of the first longitudinal which terminates in the second, the absence of the marginal cross-vein, the first and second submarginal cells being both petiolate, the position of the small cross-vein, and lastly the shape and position of the discal cell.

"This genus seems undoubtedly related to *Gonomyia*." (*Skuse.*)

Range. Australia and India.

The præfurca (that is, the basal section of the 2nd longitudinal vein from its origin to its fork) is shown in Skuse's own plate as beginning just *before* the middle of the wing and not after it, as he says in his description of the genus. It originates in my new species at the same spot as in *L. singularis*, Skuse.

The auxiliary vein ends at the middle of the wing; the 1st longitudinal vein extends to about three-fourths of the wing and turns down, meeting the 2nd longitudinal at (*singularis*) or just beyond (*bengalensis*) its fork, thus dividing the marginal cell into two parts. The 2nd vein begins a little before the middle of the wing at a rather wide angle, turning up rather angularly before the middle of the præfurca, and forking at a little beyond its entire length (*bengalensis*) or at two-thirds of its length (*singularis*), the branches diverging at their tips. The upper submarginal cell is subtriangular (*singularis*) or elongate-conical (*bengalensis*). The 3rd vein originates at the angle in the præfurca and is nearly straight, ending at about the wing-tip or just below it; the anterior cross-vein placed distinctly before the origin of the 3rd, of ordinary length, and over the middle of the discal cell, which latter is elongate, about three times as long as broad, rather irregular in shape with its inner end pointed. The 4th vein has the upper branch forked, the lower prong with a rectangular basal section which forms half the distal side of the discal cell, the discal cross-vein forming the remaining half. The lower branch of the 4th vein simple, slightly sinuous in both the known species; the 5th, 6th and 7th veins nearly straight. Posterior cross-vein just beyond base of discal cell (*singularis*) or a little before its middle (*bengalensis*). Anal angle of wing somewhat rounded.

336. **Lechria bengalensis**, *Brun.* (Pl. IX, fig. 4.)

Lechria bengalensis, Brunetti, Rec. Ind. Mus. vi, p. 301 (1911).

♂ ♀. *Head* blackish grey; frons rather broad and flat, with short sparse hairs; proboscis yellowish, palpi dark. Antennæ black; 1st joint of scape long, 2nd short, both broader than the 14-jointed flagellum, which has traces of white at the tip of each joint and at the base of the 1st joint. *Thorax* yellowish, well arched, mesonotal suture deep, posterior to which the colour of the dorsum is pale livid brown, as is the scutellum; metanotum, blackish grey. Sides of thorax yellowish, pleuræ a little dusted with white. *Abdomen* moderately dark yellowish grey, with short yellow hairs; belly concolorous, genitalia in both sexes small, brownish yellow. *Legs* brownish yellow, thin and long; femora with some stiff black hairs at the tip which, if viewed from certain directions, give almost the appearance of two black spines; tibiæ unspurred. *Wings* clear yellowish grey, veins distinct. Auxiliary vein ending just beyond middle of wing, the subcostal cross-vein at its tip; the 1st longitudinal ending in the 2nd at the point where this latter vein forks; the 2nd vein originating at or just beyond the middle of the wing, at a sharp angle and turning at one-fifth of its length suddenly upward, forking beyond its middle, where it meets the tip of the 1st vein, the upper branch shorter than the lower one; the 3rd vein issuing from the 2nd at the angle in the præfurca, the anterior cross-vein placed just before this point; the latter of moderate length, placed over the middle of the discal cell, which is in the middle of the wing, three times as long as broad, the proximal end pointed, emitting three nearly parallel veins to the wing-margin; posterior cross-vein near base of discal cell; 5th, 6th, and 7th veins nearly straight.

Length 4 millim.

Described from a male and three females dated respectively Pusa, 15. viii. 08 (*type* ♂); Calcutta, 19. viii. 07 (*type* ♀) and 18. vi. 09; Bangalore, 3000 ft., 12. x. 10 (*Annandale*); Pusa, 16. vii. 10. Dr. Annandale has found it on tree-trunks in gardens.

Type ♂ in Pusa collection, ♀ in Indian Museum.

The venation of this genus is distinctly abnormal, the only previously known species, *L. singularis*, Skuse,* coming from Australia. The 1st longitudinal vein ends in the 2nd at the point where the latter forks widely, thus giving the appearance of two long veins crossing one another at an angle of 45°, the point of contact in *singularis* being punctiform. In my species the point of contact appears almost as a small cross-vein.

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* With the exception of *L. lucida*, Meij., recently described from Java; Tijd. Ent. liv, p. 53 (1911).

Prof. Kertész places *Lechria* in the ERIOPTERINI, near *Gonomyia*, to one species of which, *G. incompleta*, Brun., it bears a remarkable resemblance in this part of the wing, and to which genus, *L. bengalensis*, as a species at any rate, is eminently akin.

The only other possible interpretation of the wing, as figured by Needham, would be to consider the 1st vein as angled towards the tip and continuing to the wing-margin, meeting at the angle the 2nd vein, which in this case would be simple, not forked, thus making only one submarginal cell, which in its turn would necessitate the genus, theoretically at least, being removed to another section of this subfamily; but its position near *Gonomyia* seems hardly questionable.

Genus **GONOMYIA**, *Mg.*

Gonomyia, Meigen, Syst. Beschr. i, p. 146 (1818).
Taphrosia, Rondani, Dipt. Ital. Prod. i, p. 182 (1856).
Goniomyia, Osten Sacken, Monog. Dipt. N. Amer. iv, p. 177 (1869).

GENOTYPE, *Limnobia tenella*, Mg. (according to Coquillett, 1910).

Head: Eyes separated by a frons about one-third to one-fifth the width of the head. Palpi and proboscis both short, joints of the former subequal. Antennæ of sixteen joints; if bent backwards they would not quite reach the root of the wings; scape normal, flagellum with the joints subcylindrical or oval, verticillate. *Thorax* oval, moderately arched, only slightly narrowed anteriorly; neck not very pronounced. *Abdomen* linear, more or less flattened, sometimes slightly broader about the middle in the female. Genitalia of male consisting of the usual pair of bi-jointed claspers of various shapes, according to the species, to which smaller appendages are attached.* *Legs* long, slender, slightly or almost microscopically pubescent; tibiæ without spurs, empodia generally distinct, occasionally wanting. *Wings* varying in length, and, to a less extent, in width and general shape, usually more or less glabrous, but in some species a very short but distinct pubescence is discernible. Venation peculiar.† Normally two submarginal cells, but in some species only one. Auxiliary vein ending opposite beginning of 2nd longitudinal

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* Describing a North-American species, Osten Sacken says of the male organs "more simple than that of the two species I have figured (*blanda* and *cognatella*). There are two lateral, elongated, subcylindrical (digitiform) lobes, converging, but not lapping over each other in repose; immediately above and parallel to them is a single long horny style, the tip of which reaches beyond the tip of the lobes; below the lobes, some small black horny organs are perceptible."

† This genus may be regarded as the centre one of a small group of genera possessing the character of the peculiar forking of the 2nd longitudinal vein making the short upper branch appear almost or quite like a cross-vein. These genera are *Empeda*, *Mongoma*, *Mongomioides*, and *Paramongoma*.

vein, a little before or beyond it, the subcostal cross-vein placed at its tip or near it; the 2nd vein beginning about the middle of the wing, arcuated, sometimes considerably so, or nearly straight, sometimes simple, but generally widely though shortly forked.* The 1st submarginal cell very short, more or less triangular, owing to the anterior branch of the 2nd vein being so much shorter than usual, and so obliquely placed as to appear almost like a cross-vein, this appearance being more conspicuous in some species than in others; its petiole long, and its inner end generally beyond the tip of the 1st longitudinal vein, or nearly opposite it; yet in the commonest Oriental species it is considerably anterior to this tip; marginal cross-vein absent; the 3rd vein with a very short or quite moderately long basal section, varying with the species, remaining portion nearly or quite straight; anterior cross-vein varying in length, placed a little forward or backward, generally in a line with the base of the 3rd vein and the proximal side of the discal cell. Discal cell open or closed; when open, it coalesces with the 3rd posterior cell, which proves it is the *anterior* branch of the 4th vein that is forked; four posterior cells: the 1st equal in length to, or shorter than, the 2nd submarginal cell, varying in width with the species: the 2nd petiolate when the discal cell is open, the petiole about as long as the cell; when the discal cell is closed, the 2nd and 3rd cells subequal, approximately normal in shape. Posterior cross-vein at some distance before the proximal side of the discal cell, or in a line with it; the 5th, 6th, and 7th longitudinal veins nearly straight.

Range. Europe, Kirghis Desert, Central Africa, North America, Brazil, the Orient, and Australia.

In characterizing the genus *Gonomyia*, Mg., in his 'Monograph of North American TIPULIDÆ,' Osten Sacken described the genus as possessing two submarginal cells, noting, however, two examples in which the anterior branch of the 2nd longitudinal vein being absent, the 1st submarginal cell was obliterated; and he expressed his opinion that if other species occurred with this character, a new genus might be founded on them. He, however, retained the form provisionally in *Gonomyia*, emending in a footnote (p. 178) his definition of the genus to warrant the inclusion of species with one submarginal cell only.

In studying the question of the nomenclature of the veins in the *Gonomyia* group, it will be seen that in this genus the 2nd longitudinal vein may (in the case of my two species *G. incompleta* and *G. flavomarginata*) be considered to be forked as usual, but the 3rd vein would, under this theory, be absent, and the anomaly of the anterior cross-vein joining the 2nd and 4th veins, instead of the 3rd and 4th as usual, would be seen.

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* In a North-American species (*G. blanda*, O. S.) it even forms a rectangle at its base, with an appendix.

Of course, a different interpretation might be offered, namely, to consider the 2nd vein as being forked and the 3rd vein present, what I recognise as the anterior cross-vein being considered its basal section; in this case the 2nd vein would end at the tip of the wing, the anterior cross-vein being obliterated, and the 3rd vein forming the whole upperside of the discal cell. But this interpretation would only cause more confusion in the identification of the ramifications of the 4th vein.

A close study of the venation of *Gonomyia*, especially of the 4th longitudinal vein with its branches, convinces me that the delineation of the veins as admitted in this work is correct. This is proved by such species as *G. proxima* and *aperta*, in which the 2nd longitudinal vein is forked, whilst the 3rd vein and the anterior cross-vein are both present. In support of this may be quoted Osten Sacken's remarks in his elaborate 'Monograph on the North-American TIPULIDÆ': "whenever the discal cell is open, it coalesces with the 3rd posterior cell, and thus it becomes apparent that it is the anterior branch of the 4th longitudinal vein which is forked"; to which he adds a footnote, "Exceptions are merely individual: thus I have seen a specimen of *G. subcinerea*, the discal cell of which was coalescent with the 2nd posterior cell."

Individual variation in this genus, it may be remarked, is rather common. Moreover, Osten Sacken (*l. c.* p. 178), noted that the anterior branch of the 2nd vein was occasionally very faint, and whilst his work was in the press, he discovered a new species, *G. manca*, in which the 2nd longitudinal vein was simple,* and he suggested that a new genus might reasonably be created for it. Nevertheless, I refrain from doing so at present, as it is evident that the genus *Gonomyia* forms a tolerably well circumscribed group of species, which it would be undesirable to dismember for each modification of venation.

Table of Species.

1.	The 2nd longitudinal vein not forked; discal cell present	2.
	The 2nd longitudinal vein shortly but distinctly forked; discal cell present or absent	3.
2.	Posterior cross-vein at base of discal cell; 1st posterior cell much narrowed at tip; margin of thoracic dorsum concolorous	*incompleta*, sp. n., p. 471.
	Posterior cross-vein distinctly before base of discal cell; 1st posterior cell barely narrowed at tip; margin of thoracic dorsum yellowish	*flavomarginata*, sp. n., p. 472.

* Exactly as in my two new species *G. incompleta* and *flavomarginata*.

3. Discal cell present, oblong, emitting three straight equidistant veinlets .. *affinis*, sp. n., p. 472.
Discal cell absent; base of 3rd posterior cell more or less pointed; anterior branch of 4th longitudinal vein forked .... 4.
4. Posterior cross-vein at base of discal cell .... *aperta*, sp. n., p. 473.
Posterior cross-vein much before base of discal cell; anterior branch of 2nd longitudinal vein sometimes indistinct, appearing almost like a marginal cross-vein .... *proxima*, sp. n., p. 474.

337. **Gonomyia incompleta**, sp. nov. (Pl. IX, fig. 5; Pl. XI, fig. 19.)

♂ ♀. *Head*: occiput blackish grey; frons and proboscis yellowish; palpi blackish; antennæ blackish, rather thickly pubescent; eyes black, facets large. *Thorax* yellowish, dorsum a little tinged with chestnut-brown, sometimes taking the form of the three usual Tipulid stripes, the outer ones being distinctly interrupted at the suture, behind which they each enlarge into a spot of considerable size; the thoracic sutures light coloured, the anterior lower part of the neck pale yellow. Scutellum yellowish, traces of a darker triangular mark at base; metanotum brown, just perceptibly dusted with grey. Dorsum of thorax sometimes with traces of light dust; the sides yellowish or brownish yellow; pleuræ concolorous or tinged with brown, generally more or less dusted with grey. *Abdomen* yellowish, the dorsum with a greater or less admixture of brown; belly generally lighter. The whole abdomen with light pale pubescence. *Legs* uniformly pale yellow. *Wings* very pale grey, somewhat iridescent. Auxiliary vein ending in the costa at about the middle of the wing; the subcostal cross-vein placed immediately before its tip; the 1st longitudinal vein ending at three-fourths the length of the wing, often becoming faint at the tip, being approximately parallel with the costa; the 2nd longitudinal vein originating just before one-third of the distance between the tip of the subcostal vein and the tip of the 1st, taking, at half its length, a sudden turn upwards, and ending in the costa some little distance beyond the tip of the 1st vein; the 3rd vein originating at the angle of the 2nd, its stem or base being very short, the rest of the vein taking a very slight curve downwards, and ending just above the wing-tip; anterior cross-vein of very unusual length, curved, its convexity towards the base of the wing, its lower end reaching the upper inner corner of the discal cell. This cell is pentagonal, approximately triangular, its inner side very short, its two distal sides about equal in length, and its anterior and posterior sides about equal to one another; the three veinlets issuing from it are equidistant at their origin, the outer ones greatly diverging; the 4th posterior cell has

almost parallel sides. The fifth vein is very gently curved, the 6th slightly sinuous, the 7th nearly straight, curved downwards towards the tip; the 1st posterior cell is about twice as wide at its base as at its tip. Halteres yellowish.

Length $3\frac{1}{2}$ millim.

Described from a long series of both sexes in the Indian Museum in excellent preservation.

Types in the Indian Museum.

338. **Gonomyia flavomarginata**, sp. nov. (Pl. IX, fig. 6.)

♂ ♀. *Head*: in male bright orange, in female orange or orange-yellow, with a dark brown median stripe. Proboscis and palpi very dark brown. Antennal scape brownish yellow; flagellum blackish brown in male with long scattered hairs, in female with white pubescence. *Thorax*: dorsum blackish, dull; a bright lemon-yellow line just below the dorsum, passing in front from wing-root to wing-root; sides of thorax reddish yellow or yellow, with a more or less distinct median transverse violet-brown stripe, which is, in at least one specimen, absent. Pleuræ, especially the sternopleuræ, which are large and shining, violet-brown. *Abdomen* dark brown, emargination of segments distinct; 1st segment sometimes black, with a little light pubescence; belly yellow. Genital organs of male conspicuous, yellow, with a pair of black palp-like processes. Ovipositor of moderate size, yellow. *Legs* brownish yellow, tibiæ and tarsi darker. *Wings* pale grey, rather vitreous and moderately iridescent. Venation considerably like that of *G. incompleta*; auxiliary vein not attaining middle of wing; 3rd longitudinal vein with a much longer base than in that species, and originating before the middle of the 2nd vein; anterior cross-vein shorter than in *G. incompleta*, so that there is not so great a difference in width between the basal and distal ends of the 1st posterior cell as there is in *incompleta*. Halteres yellowish, dorsum of clubs blackish.

Length 2–3 millim.

Described from three males and seven females in the Indian Museum: Kurseong, 20. vi. 10 (*type* male), 18 and 22. vi. 10, two other males; 6. ix. 09 (*type* female), and two other females, 20. vi. 10; all taken by Dr. Annandale; and one female from Darjiling, 7. viii. 09 (*Jenkins*).

Types in the Indian Museum.

In most specimens the very distinct orange colour of the upper and back part of the head makes this species easily distinguishable, but the length of the base of the 3rd vein, which is a distinct specific character, appears to be slightly variable.

339. **Gonomyia affinis**, sp. nov. (Pl. IX, fig. 7.)

♂ ♀. *Head*: dark grey. Proboscis yellowish, palpi black. Antennæ dark yellowish brown or dark brown, rather shortly and

moderately pubescent. *Thorax*: dorsum dark brownish grey, the colour almost taking the form of three longitudinal contiguous stripes; mesonotal suture pale yellowish, as is also the longitudinal depression on the post-sutural part of the dorsum; side margins below the level of the dorsum pale yellowish white, but not so distinctly continued round in front as in *G. flavomarginata*; sides of thorax yellowish, especially posteriorly, microscopically dusted with bluish-black. Scutellum bright lemon-yellow, with a small dusky triangle at base. *Abdomen* dark brown, emarginations of segments moderately distinct, with pale hairs, which are more conspicuous at the sides; belly more yellowish; ovipositor yellowish. *Legs* brownish yellow, coxæ and base of femora paler. *Wings* clear, moderately glabrous. Auxiliary vein ending a little further beyond the origin of the 2nd longitudinal vein than in the previous two species; 2nd vein forked, the upper branch bisinuate, the lower one nearly straight; base of 3rd vein (placed at the angle of the 2nd) almost punctiform, running straight to immediately above the wing-tip and almost parallel with the upper branch of the 4th; the 1st posterior cell being, however, distinctly though not greatly wider at the base than at the tip; anterior cross-vein straight, shorter than in the two previous species; discal cell pentagonal, the three veinlets straight, the outer ones diverging. Stigma distinctly present, pale blackish, elongated, but without sharp delineation. Halteres pale dirty yellow.

Length $2\frac{1}{2}$–$3\frac{1}{2}$ millim.

Described from one male and several females in the Indian Museum; *type* male from Kurseong, 13–16. vii. 07, *type* female from Darjiling, 5. viii. 09 (*Paiva*); other females from Darjiling, 9. viii. 09 (*Jenkins*), Kurseong, 25–28. iii. 10, on window, 5–7. vii. 08, and 22. vi. 10 (all *Annandale*).

The last specimen mentioned has the posterior cross-vein near the middle of the discal cell.

340. **Gonomyia aperta**, sp. nov. (Pl. IX, fig. 8.)

♂. *Head* mainly yellowish, neck dark. Proboscis and palpi blackish; antennal scape yellowish; flagellum blackish, with pale pubescence. *Thorax*: dorsum and dorsum of scutellum medium grey with a slight brownish tinge, lighter along the sutures; sides in front of wing whitish grey, posteriorly yellowish, with a trace of whitish dust; sternopleuræ brownish. Edge of scutellum and the metanotum yellowish. *Abdomen* yellowish, a little black at base and tip. Genitalia conspicuous, brownish yellow, consisting apparently of a pair of large claspers, a ventral elongated piece and two pairs of filamentous appendages, the upper ones being much the shorter. *Legs* yellowish, darker towards the tips. *Wings* pale yellowish grey, nearly clear, distinctly glabrous. Stigma distinct but ill-defined, pale blackish. Auxiliary vein ending at the origin of the 2nd longitudinal; lower branch of fork of

2nd vein twice as long as its upper branch; base of 3rd vein short, vein nearly straight; anterior cross-vein rather long, nearly straight; discal cell incomplete, coalescing with 3rd posterior cell; upper branch of 4th vein rather widely forked. Halteres yellow.

Length 2½ millim.

Described from a unique male from Katihar, Purneah district, 29–31. xii. 09 (*Paiva*).

Type in the Indian Museum.

Although only a single specimen is present, there is no doubt that it forms a distinct species, as proved by the venation, its only ally being *G. proxima*, from which the position of the posterior cross-vein easily distinguishes it.

341. **Gonomyia proxima**, sp. nov. (Pl. IX, fig. 9.)

♂ ♀. *Head* dark grey or blackish. Proboscis and palpi dark brown or black, antennæ light to dark brown; the latter robust, with three or four long hairs on each joint in addition to the short black pubescence. *Thorax*: neck black; dorsum moderately dark grey or brownish, the sutures a little lighter; sides yellowish, with a more or less distinct dark lateral stripe; pleuræ apparently not darker. Scutellum concolorous with thorax; metanotum a little darker. *Abdomen* brown, darker in female, with a little pale pubescence; genitalia in both sexes of moderate size, yellowish. *Legs* yellowish, darker towards tips, closely pubescent, more so than in any of the other Oriental species. *Wings* pale grey; venation considerably like that of *G. aperta*, yet distinctly forming a different species. Stigma as in *aperta*. Auxiliary vein extending to rather beyond the origin of the 2nd longitudinal vein; basal portion of 3rd vein much longer than in *aperta*, the latter vein distinctly curving downwards towards the tip; posterior cross-vein placed much before the inner side of the discal cell, which is incomplete, coalescing with the 3rd posterior cell. Halteres blackish.

Length 4–6 millim.

Described from a male and female taken *in cop.* by Mr. B. L. Chaudhuri, of the Indian Museum, at Chotajulla, Rajmahal, Bengal, 14. ii. 10. Also from a damaged specimen which I refer to this species, from Tirvani, base of Nepalese Himalayas, 27. xii. 09, sent by Mr. B. Warren; a female from Rajshahi, Eastern Bengal, 1–6. ii. 07 (*Annandale*), and one from Noalpur, base of Nepalese Himalayas, 15. ii. 08.

Types in the Indian Museum, also most of the other specimens referred to; cotype ♀ in the Pusa collection.

Genus EMPEDA, *Os. Sac.*

Empeda, Osten Sacken, Monog. Dipt. N. Amer. iv, p. 183 (1869).
Ilisophila, Rondani, Dipt. Ital. Prod. i, p. 180 (1856).

GENOTYPE, *E. stigmatica*, Os. Sac.; by original designation.

Closely allied to *Gonomyia*, Mg., but differing from it in the following particulars:—

Marginal cross-vein present, but, owing to the shortness of the anterior branch of the 2nd longitudinal vein, it is not this branch, but the petiole of the 1st submarginal cell which the marginal cross-vein connects with the 1st vein. The cross-vein is thus placed between the origin of the 3rd vein and the fork of the 2nd, nearer to the former than the latter. The auxiliary vein is longer, extending distinctly beyond the base of the 2nd vein for some distance, instead of ending about opposite that point, as in *Gonomyia*. When the discal cell is open it coalesces with the 2nd posterior cell, not the 3rd, showing that it is the posterior branch of the 4th vein that is forked, and not the anterior one, as is the case in the preceding genus. The male genitalia are of different construction.*

Range. Europe, North America, Greenland, Java, and India.

Although closely allied to *Gonomyia*, this genus should not be difficult of identification, the most conspicuous characters being its longer auxiliary vein, the presence of the marginal cross-vein, and the forking of the *posterior*, not anterior, branch of the 4th vein.

342. Empeda inconspicua, sp. nov. (Pl. IX, fig. 10.)

♂ ♀. *Head*: occiput light grey. Proboscis and palpi dark yellowish brown. Scapal joints of antennæ large, black; flagellum dark, the joints narrow and elongated, practically bare except for a single hair on each side of each joint. *Thorax*: dorsum dark mouse-grey, sometimes tinged with brown; a pale yellow line is in some specimens rather conspicuous just below the grey colour of the dorsum; sides of thorax brownish yellow: pleuræ a little bluish, with microscopic grey dust. Scutellum rather bright yellow, dorsum more or less darker: metanotum blackish. *Abdomen*: dorsum dark brown, a little paler on the belly; short sparse gold hairs dorsally and ventrally. Genitalia of the male large and conspicuous, yellow, hairy, consisting of a pair of two-jointed claspers and, apparently, two pairs of considerably smaller ones. Ovipositor of the female normal, of moderate size, brownish yellow. *Legs* brownish yellow, darker towards tips; coxæ comparatively shorter than usual, the trochanters being longer than usual, nearly as long as the coxæ. *Wings* clear, iridescent.

* According to Osten Sacken, who, however, never critically examined them in a living specimen, they are of more simple structure than in *Gonomyia*.

Auxiliary vein ending some distance beyond origin of 2nd vein: 2nd vein forked just before half its length; marginal cross-vein joining the 1st to the 2nd vein some distance before the forking of the latter, and not much beyond the origin of the 3rd, the base of which is short, the vein running parallel with the lower branch of the 2nd vein; anterior cross-vein moderately long; 1st posterior cell with parallel sides. Discal cell absent; lower branch of 4th vein forked early, the veinlets diverging rather widely; the 5th, 6th, and 7th veins nearly straight, the latter rather widely diverging from the 6th. Halteres yellow.

Length 2–3 millim.

Described from four males and four females in the Indian Museum; some taken at Darjiling, 7000 ft., 25–29. v. 10, by me in grass on the hillside in shady places; others taken at the same place, 6–8. viii. 09, by Mr. Paiva, and two females from Kurseong, 22–26. vi. 10 (*Annandale*), and one male from Darjiling, 3–9. vi. 09 (*Howlett*).

Types in the Indian Museum.

Genus **MONGOMA**, *Westw.*

Mongoma, Westwood, Trans. Ent. Soc. Lond. 1881, p. 364.

Genotype, *M. fragillima*, Westw.; by original designation.

Head rather small; proboscis short, palpi small and short, 4-jointed. Antennæ slender, 16-jointed, pubescent, reaching (if bent backwards) just beyond the root of the wings; scape with the 1st joint elongate or oval, the 2nd very short, of about equal width; the flagellar joints elongate oval, approximately equal.* *Thorax* oval, a little compressed anteriorly, neck short. *Abdomen* elongate, slender, linear, sides approximately parallel in the male and slightly broader beyond the middle in the female. Genitalia small and inconspicuous. *Legs* extremely long and slender, three or four times the length of the body; front femora with two small spines above near the base projecting outwards; tibiæ with apical spurs; ungues acutely elongated, rather curved and a little dilated near the base; empodia absent. *Wings* with two submarginal cells, four posterior cells, a discal cell, anal cell closed; anterior cross-vein absent. Auxiliary vein ending distinctly beyond middle of wing; the 1st longitudinal vein ending only

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* Westwood's description of the antennæ runs "1st joint broadly oval, 2nd very short indeed, 3rd, 4th, and 5th about equal in length to the 1st and thicker than the remainder, 6th and rest very slender and nearly equal." It is, however, inadvisable to regard such minute differences as of generic value, since the joints are found to show some degree of variation in many species in this family. In my new species *M. pallidiventris*, the 2nd scapal joint is nearly half as long as the 1st, in *M. tenera* all the flagellar joints are about equal, except the first, which is slightly longer, a character present in many species of Tipulidæ.

a little beyond the tip of the auxiliary; the 2nd longitudinal vein beginning at the first third of the wing, the præfurca being two-thirds the length of the vein, the fork very wide, the upper branch approximately at an angle of 45°, the lower branch ending just above or below the wing-tip; marginal cross-vein very distinct, oblique, leaning backwards, joining the 1st vein just before its tip, and the 2nd vein just before it forks; the 3rd vein appearing almost as a continuation of the first section of the 2nd vein, that is to say, it emerges at the first third of the 2nd vein, losing itself in the 4th longitudinal vein at the upper basal corner of the discal cell; *the anterior cross-vein is therefore absent.* Upper and lower branches of the 4th longitudinal both forked, the veinlets parallel (*pennipes*) or gently diverging (*fragillima*). *The 1st posterior cell is absent*, through the absence of the anterior cross-vein, the uppermost of these cells is therefore the 2nd, which, with the 4th, is pointed at the base (*fragillima*), or approximately rectangular (*pennipes*). Discal cell longer than broad, hexagonal; posterior cross-vein at or just before the base of the discal cell, short; 5th vein bent suddenly downwards at its junction with the posterior cross-vein, until it meets the 6th vein (which is nearly straight) before its tip, closing the anal cell; 7th vein very short, gently curved.*

Range. As restricted by me, the genus occurs in Tropical Africa, Madagascar, Borneo, Philippine Islands, India and Ceylon.

Mr. Edwards resurrects Bigot's genus *Trentepohlia* to take the place of *Mongoma*, but this genus cannot stand, being insufficiently characterised; in fact, its simple inclusion in a table with such incongruous material as *Dixa* (a separate family), *Ptychoptera*, and *Dolichopeza* (the latter appearing a second time as *Apeilesis*), both representing totally different subfamilies; with such genera as *Anisomera*, *Ula*, *Erioptera* (as *Octavia*), each belonging to a different section of LIMNOBIINÆ, and finally with "*Ligonevra*" (=*Lygoneura*, Mg., belonging to the MYCETOPHILIDÆ!), is most certainly no characterisation whatever. Moreover, the nomination of a type species in itself does not, in my opinion, constitute a generic diagnosis.

As *M. fragillima*, Westw., was the original type of *Mongoma*, Westw., that species must of course remain the type of the restricted *Mongoma*. Two other Oriental species belong here also, *tenera*, Os. Sac., and *pennipes*, Os. Sac., the former from the Philippines and India, the latter from Borneo, India, and Ceylon.

Out of the material previously comprised in Westwood's genus *Mongoma*, I established recently † two additional genera, *Paramongoma* and *Mongomioides*, based on well-defined and apparently

* Westwood does not mention the 7th vein in his description, though it is clearly shown in the plate.

† *Vide* Rec. Ind. Mus. vi, p. 291 *et seq.*, for full discussion of the three genera in detail.

constant differences in venation. *Paramongoma* need not here be discussed, since the only Oriental species is the *P. albitarsis* of Doleschall, described many years ago from Java and apparently never recognised since.

The other two may be easily separated as follows :—

Four posterior cells; * discal cell present	*Mongoma*, Westw.
Three posterior cells; discal cell absent	*Mongomioides*, Brun.

Mongoma (*sensu lato*) is highly interesting as presenting one of the most conspicuous variations from the normal type of venation in this family. Previous to describing the genus Prof. Westwood wrote to Osten Sacken for his opinion, and the latter's reply is indicative of its abnormality in his words: "The systematic position of this species (*M. fragillima*) is very puzzling . . . ." He pointed out that the apparent resemblance between its venation and that of *Paratropeza*, Sch.,† was only superficial and that it was certainly a new genus.

Westwood's figure of the original species, *M. fragillima*, from Central Africa, is excellent, and clearly portrays the distinctive features of the genus; the long auxiliary vein ending only just before the tip of the 1st longitudinal; the wide forking of the 2nd vein, which, with the marginal vein, gives a first impression of the marginal cell being divided by two cross-veins into three portions; *the merging of the 3rd longitudinal vein in the 4th*,‡ at the upper basal corner of the discal cell, thereby causing the *absence of the anterior cross-vein*; the abrupt curve downwards of the end of the 5th vein, closing, in most cases (speaking *sensu lato*), the anal cell; the shortening of the two basal cells and the very short 7th vein,—all characteristic features of this singular genus.§

Even Osten Sacken, than whom no better authority on TIPULIDÆ

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* As regards the names of the posterior cells, it must be remembered that, as the anterior cross-vein is wanting, the *first posterior cell* is absent, and that the uppermost of the posterior cells, whether four or only three be present, is, strictly speaking, the *second* and not the first. This view is confirmed by Williston.

† For description of *Paratropeza* see Verh. zool.-bot. Ges. Wien, xvi, p. 932 (1866).

‡ This view is in accord with Williston's opinion (Tr. Ent. Soc. 1896, p. 292), but I only recently saw this author's paper, long after I had studied the question personally.

§ Of course, if the short vein joining the 2nd vein with the discal cell (or the corresponding part of the 4th vein when the discal cell is absent) be considered the anterior cross-vein instead of the 3rd longitudinal vein, it follows that there would be only one submarginal cell in any of the three genera concerned, and the cell exterior to the anterior cross-vein will become the 1st posterior cell. This would give *Mongoma* five posterior cells, and *Mongomioides* and *Paramongoma* four posterior cells each. In support of this suggestion it may be urged that the 3rd vein is not known elsewhere to terminate in the interior of the wing. Personally I know of no case where it does so, but it must be remembered that excessive abnormalities are not rare

is known, recognised the difficulty in allotting to the veins their correct names (Berl. Ent. Zeits. xxvi, p. 90), and in describing his first new species in the genus, *M. tenera*, from the Philippine Islands, he says in a footnote (referring to the words "the presence of the two cross-veins inside the marginal cell" used in the text): "I call them cross-veins merely for shortness' sake, because one of them may also be considered as a branch of the 2nd vein." He spoke of the genus as representing "a form of venation which is of very rare occurrence among Diptera, and we must suspend our judgment on this point * until we have an opportunity of seeing the insect from Java described by Doleschall."

At this time he was accepting three species as congeneric, *fragillima*, Westw., *albitarsis*, Dol. (which latter it is evident from the above quotation he had never seen), and his new species *tenera*. In pointing out the difference of Doleschall's species in having only three posterior cells instead of four, as in *fragillima* and *tenera*, it is obvious that he was guided by Doleschall's figure alone. The Dutch author's remark "two marginal cells" does not help in the question of terminology.

Table of Species.

Middle tibiæ with conspicuously thickened tips through the presence of short snow-white pubescence	*pennipes*, Os. Sac., p. 479.
Middle tibiæ without such adornment.	
Legs mainly yellowish; femora whitish at tips	*tenera*, Os. Sac., p. 480.
Legs mainly blackish; femora pale at base	*pallidiventris*, sp. n., 481.

343. **Mongoma pennipes**, *Os. Sac.* (Pl. IX, fig. 14; Pl. XI, fig. 13.)

Mongoma pennipes, Osten Sacken, Berl. Ent. Zeits. xxxi, p. 204 (1887).

♂ ♀. Body bright brownish yellow or yellowish, very much like *Mongomioides trentepohlii*, but the proboscis, palpi, and antennæ are yellowish, the latter more or less darker. *Thorax*: in some specimens three shining rather brownish thoracic stripes are distinctly visible, the side ones much abbreviated in front, but continued beyond the suture; in other specimens the whole thoracic dorsum is almost unicolorous. *Abdomen* with a little pale pubescence,

in TIPULIDÆ. It may also be urged in analogy that in *Sciara*, a very extensive and dominant genus of MYCETOPHILIDÆ, the anterior cross-vein invariably takes a longitudinal position. To my thinking, however, the vein has every appearance of the 3rd longitudinal vein by its manner of origin, its superior length to the usual anterior cross-vein, and the cell concerned has much more the appearance of a submarginal cell than of that of the 1st posterior cell.

* *I. e.*, the correct identification of the veins.

concolorous to the tip. Genitalia of both sexes small. *Legs* pale brownish yellow, the tibiæ becoming blackish on the apical half, but the actual tips are broadly snow-white, and the middle pair have the snow-white portion thickened, much longer in extent, and with a fringe of snow-white hairs on each side; tarsi snow-white. *Wings* clear; halteres pale yellow.

Length 7–8 millim.

Redescribed from several specimens of both sexes in the Indian Museum, with localities as follows:—Calcutta, 22. ii. 10 (at light), 26. iii. 07, 28. v. 07, 29. vi. 09, 28, vii. 07 to 29. viii. 07, 26–30. ix. 07; Sukna, 500 ft., 1. vii. 08; the specimens mostly collected by Dr. Annandale; Peradeniya, Ceylon, 12–16. vii. 10 (*Green*), and 16. ix. 09, at light.

Type ♂ in the Berlin Museum.

Apparently by no means an uncommon species in Calcutta throughout a considerable part of the year.

The conspicuous snow-white thickening of the tips of the middle tibiæ easily differentiates this species from all others in this group. It was originally described from the single type male now in the Berlin Museum, taken at Tumbong Hiong, Borneo. Apparently the female has not been noted before.

344. **Mongoma tenera**, *Os. Sac.*

Mongoma tenera, Osten Sacken, Berl. Ent. Zeits. xxvi, p. 89 (1882).

♂ ♀. *Head* small, blackish or dark brown; proboscis short, yellowish; palpi dark brown; eyes separated by a narrow frons. Antennæ dark brown, with a little pale pubescence, if "bent backwards, they would reach a little beyond the root of the wings; joints of the flagellum long, of nearly equal length, except the first, which is a little longer; short-verticillate" (*Osten Sacken*). *Thorax* light brown or reddish brown, paler at the sides. Prothorax well developed, prolonged into a short neck. *Abdomen* darker brown, with pale pubescence, the tip blackish; belly yellowish. Genital organs of both sexes small, black. *Legs*: coxæ very pale brownish yellow; femora brown, extreme tips whitish; tibiæ very pale brownish yellow, becoming whitish towards tips; tarsi wholly white. *Wings* clear or very pale greyish; halteres brown.

Length 3½–5 millim.

Redescribed from two males and a female in the Indian Museum, the former bearing labels, Sukna, North Bengal, 1. viii. 08, and Nedumangad, South India, 14. xi. 09, and the single female, Sukna, 1. vii. 08, all taken by Dr. Annandale.

Type. The location is uncertain; originally in Osten Sacken's own collection.

Osten Sacken's original description is incorporated with the present redescription.

In the three examples herein described, there is a slight variation from the original description of the species, as the base of the 3rd posterior cell is distinctly more proximal than that of the

2nd, and is pointed (as it is in *M. fragillima*, Westw., from Africa). The bases of these two cells should be in a line according to the author of the species. Again, in two of the present specimens the posterior cross-vein is in a line with the base of the discal cell, and occurs a little before it in the third, but this character is known to be variable in the family, and there is little reason to doubt the identity of the present form with Osten Sacken's species.

345. **Mongoma pallidiventris**, sp. nov.

♀. *Head* black; back of head conical, with bristly hairs; eyes contiguous above. Proboscis conical, elongated, bilobed, hairy; palpi yellowish brown. Antennal scape yellow, 1st joint cylindrical, rather long, 2nd half as long, wider at tip; flagellum of fourteen equal elongated dark brown joints; the whole antennæ minutely pubescent, each joint bearing a few long hairs. Neck shortly conical, with a single transverse row of strong hairs. *Thorax*: dorsum dark mahogany-brown with a black middle stripe in front of the suture; the post-sutural mesonotum divided by a wide post-sutural yellowish depression; sides of thorax wholly yellowish, also the scutellum, which is sometimes tinged with brown, bearing a few hairs; dorsum of metanotum dark brown, quite bare. An irregular row of hairs on each side of the thoracic dorsum, extending nearly to the suture; behind the suture a row of longer bristly hairs on each side, also two fan-shaped sets of hairs below the root of each wing. *Abdomen* brown, shortly pubescent; blacker at base, and more or less on posterior borders of segments; tips yellowish. Belly uniformly livid yellow. Ovipositor yellow, rather long, slightly curved, apparently encased at will in a sheath-like arrangement on the ventral side of the last segment. *Legs* black, minutely pubescent; coxæ and trochanters livid yellow; femora pale at base, with a few long hairs at tip, hind pair with minute serrulation below at base; tibiæ whitish at tips; tarsi whitish. *Wings* clear, veins distinct, black; stigma indistinctly brownish; discal cell present; venation as in *M. pennipes*, Os. Sac. Halteres brown.

Length 5–6 millim.

Described from four females (including *type*) in the Indian Museum from Pallode, 20 miles N.E. of Trivandrum, Travancore, S. India. 15.xi.08 (*Annandale*).

MONGOMIOIDES, *Brun.*

Mongomioides, Brunetti, Rec. Ind. Mus. vi, p. 296 (1911).
Trentepohlia, Bigot, Ann. Soc. Ent. France, (3) ii, p. 473 (1854).

GENOTYPE, *Limnobia trentepohlii*, Wied.; by present designation.

Differs from *Mongoma* by possessing only three posterior cells instead of four, and by the discal cell being absent. It agrees with *Mongoma* in the presence of the 3rd longitudinal vein, and in the anal cell being closed at a greater or less distance before the border.

The marginal cross-vein (in the four species known to me) is more distal than in *Mongoma*; and the 1st section of the 2nd longitudinal vein (*i. e.* that portion up to the origin of the 3rd vein) is shorter than in *Mongoma*, being not longer than one-third the length of that vein. Upper branch of 4th longitudinal vein nearly straight, or gently curved; posterior cross-vein distinctly but not much before the fork of the 4th longitudinal vein. (This may be found a variable character, when additional species are discovered.) Remainder of venation and all other characters as in *Mongoma*.*

Range. Sumatra, India, and Ceylon.

Bigot's genus *Trentepohlia* is synonymous with *Mongomioides*, but was hopelessly uncharacterised (*vide* p. 447), and it is to be regretted that Dr. Enderlein has attempted to revive it. But for Bigot's mention of *M. trentepohlii* as the type species, it would never have been identified.

Table of Species.

Wing-tip distinctly though sometimes faintly blackish	*trentepohlii*, Wied.
Wings pale grey, with lighter spaces ..	*marmorata*, sp. n.
Wings clear	*nigroapicalis*, sp. n.

346. **Mongomioides trentepohlii**, *Wied.* (Pl. IX, fig. 13.)

Limnobia trentepohlii, Wiedemann, Auss. Zweifl. i, p. 551, pl. vi *b*, fig. 12 (1828).

♂ ♀. Body wholly yellowish, occasionally a little tinged with brownish, especially on the abdomen, the tip of which is generally blackish. *Head* greyish, with black hairs. Antennæ and palpi more or less dusky, especially the former, which often has the tip of the 1st joint blackish, and sometimes wholly so. *Thorax* slightly shining, with the merest trace of a dusky median stripe. *Abdomen* with short, very pale hairs. *Legs* wholly concolorous. *Wings* clear, veins distinct; tip of wing blackish, especially along the end of the 2nd longitudinal vein with its upper branch; the cross-veins in the middle of the wing are also more or less suffused; the darkening of the wing-tip is distinctly variable, both in extent and intensity. Halteres pale yellow.

Length 5–6 millim.

Redescribed from several specimens of both sexes in the Indian Museum from the following localities:—Kushlea, Bengal, 7–8. x. 09 (*Jenkins*); Bhogaon, 2. x. 08, and Katihar, Purneah, 1–24. ix. 10, 2–12. x. 07 (*Paiva*); Shamnagar, E. Bengal, 25. viii. 07 (*Caunter*); Port Canning, 9. x. 08; Puri, Orissa Coast, 23–26. x. 08, and 13. xi. 10, at light in railway carriage (*Annandale*); Mazbat, 11–15. x. 10 (*Kemp*); Shasthancottah, Travancore, 8. xi. 08;

* For a full discussion as to the interpretation of the veins and cells, see Rec. Ind. Mus. vi, p. 291 *et seq.*, where my line of reasoning is given in full, with corroborative opinions of various authorities.

Rangoon, 25. ii. 08 (all *Annandale*); Sylhet, 5. ii. 05 (*Lt.-Col. Hall*).

Types originally in Dr. Trentepohl's and Wiedemann's collections, presumably now in the Vienna Museum.

This species is likely to prove to have an extensive distribution in the East, and is probably fairly common in Bengal and the south-eastern parts of India. The clouded wing-tip makes it easily recognisable from all other species in this group.

347. **Mongomioides marmorata**, sp. nov. (Pl. IX, fig. 11.)

♀. *Head* black; eyes contiguous, face black; proboscis, antennæ, and palpi yellowish; back of head with few hairs. *Thorax* yellowish, practically bare; dorsum more orange, with traces of a median dark line on anterior part. Scutellum and metanotum apparently concolorous (damaged by pin). *Abdomen* yellowish brown, dorsum with a tendency to dark marks; minutely pubescent. Genitalia very large, yellow, hairy; consisting of upper and lower halves, the lower terminating in a sheath, the upper in a two-bladed, rather short, stiff ovipositor. *Legs* uniformly pale yellow. *Wings* pale grey, with lighter spaces; the fore border shows four such, of which the first reaches to the posterior border at the end of the 7th vein; the second extends to the basal part of the marginal cell; the third reaches the submarginal cell; and the fourth, a smaller one, is towards the end of the wing; the base of the wing and the 3rd posterior cell are also nearly clear. Venation as in *trentepohlii*, Wied. Halteres brown, stem pale yellow.

Length 4 millim.

Described from a unique specimen, Calcutta, 28. xi. 07, in the Indian Museum collection.

348. **Mongomioides nigroapicalis**, sp. nov. (Pl. IX, fig. 12.)

♂. *Head* blackish grey; back of head brownish yellow. Proboscis brownish yellow; palpi comparatively long and stout, dark brown, nearly black, pubescent. Antennæ brownish yellow, scapal joints large, remainder oval, pubescent. *Thorax*: neck rather long, blackish. Dorsum and sides uniformly brownish yellow; a narrow median black stripe on dorsum; posterior part of dorsum, scutellum and metanotum (apparently *) rather darker. *Abdomen* brownish yellow. *Legs*: coxæ and femora moderately bright yellow, rather broadly black at the tips; tibiæ very pale yellowish white, very narrowly black at the tips; tips of tarsi blackish. *Wings* elongate, practically clear, unmarked. Auxiliary vein ending at middle of wing, the 1st longitudinal a little beyond; the 2nd longitudinal beginning before the middle of the wing, rather widely bisinuate, forked at a little beyond its middle, the upper branch short and nearly perpendicular, as

* Specimen damaged in this part.

usual; the lower branch ending just above the wing-tip; the short, upright marginal cross-vein joined to the 1st vein, where it turns suddenly upward at its tip into the costa; præfurca divided into about three equal sections, the origin of the 3rd vein being at the end of the first section, the marginal cross-vein at the end of the second; the 3rd vein emerging at a rather wide angle, in a line with the basal section of the præfurca and for about as long as that section, afterwards merged in the 4th longitudinal vein at the upper basal corner of the 2nd posterior cell; upper branch of 4th vein forked at one-third of its length, the veinlets parallel; the 4th vein forking a little beyond the origin of the 3rd vein; the basal side of the 2nd posterior cell rectangular; the lower branch of the 4th vein nearly in a line with the basal section, the whole vein describing a gentle curve; posterior cross-vein situated just before fork of 4th vein, joining the 5th vein (which is much fore-shortened) at the point where it suddenly bends down and joins the 6th, thus closing the anal cell; the short terminal portion of the 5th vein practically in a line with the posterior cross-vein; the 6th vein quite straight, the 7th very short, only one-third as long as the 6th, curved suddenly into the margin of the wing. Halteres pale.

Length 4 millim.

Described from a type-specimen from Lucknow, 5. iii. 11, two others with the same data, and one from Peradeniya, Ceylon, v. 09.

Type in the Indian Museum.

Genus **PARAMONGOMA**, *Brun.*

Paramongoma, Brunetti, Rec. Ind. Mus. vi, p. 295 (1911).
Mongomella, Enderlein, Zool. Jahr. xxxii, p. 61 (1912).

Genotype, *Cylindrotoma albitarsis*, Dol.; by present designation.

This genus differs from *Mongoma*, Westw., also in the venation only; principally by the punctiform contact of the 2nd longitudinal vein with the discal cell, thus obliterating the 3rd vein. The discal cell emits only three veins, for arguing from analogy and comparing the wing with that of *Mongoma*, it should be the anterior branch of the 4th longitudinal vein that is forked, thus making only three posterior cells, of which the 1st and 2nd are of equal length, and with pointed bases. The anal cell is open somewhat narrowly but distinctly.

Range. Java.

The only Eastern species that at present is referable to this genus is *P. albitarsis*, Dol. (Nat. Tijds. Ned. Ind. xiv, p. 391, pl. iv, fig. 1), which has not yet been found in British India, being originally described from Java, and apparently not having been seen since.

Doleschall's figure is rather carelessly drawn, as the 1st longitudinal vein is shown emerging from the auxiliary vein near its tip; the 2nd vein is straight after the bend, which takes place at

the exact corner of the discal cell, there being *neither 3rd longitudinal vein nor anterior cross-vein.* There are only three posterior cells, of which the first two are subequal, with obtuse-pointed bases; the posterior cross-vein is a little beyond the base of the discal cell, which is about twice as long as broad. The anal cell is open; apart from this, the 5th and 6th veins bear the same relation to each other as in *Mongoma.* The 7th vein is not shown, perhaps owing to the full insect being illustrated, with the wings rather close to the body; in this position the 7th vein would be easily obscured by the proximity of the wing to the abdomen.

As *P. albitarsis*, Dol., will probably be found to occur in South India or Ceylon, and has been made the type of a new genus, it is advisable to append a brief description of it.

The species is greyish brown in colour, with short pubescence; head globular: eyes large, black, kidney-shaped; proboscis moderately long. Flagellum of antennæ of fourteen subequal cylindrical joints becoming smaller towards the tip of the antennæ. Abdomen narrow, tip pointed and black. Legs very long, tarsi snow-white. Doleschall speaks of only two posterior cells, but this is only due to a different method of naming them. Found on warm damp days dancing in the air. I have not seen the species myself.

But for the difference in venation it must be very like *Mongoma pennipes*, Os. Sac., but the conspicuously thickened tips of the white middle tarsi will at once distinguish the latter species.

Mongomella, End., is an absolute synonym of *Paramongoma*.

Genus SYMPLECTA, *Mg.*

Symplecta, Meigen, Syst. Beschr. vi, p. 282 (1830).
Helobia, St. Fargeau, Encyl. Méth., Ins. x, p. 585 (1825).
Idioneura, Philippi, Verh. zool.-bot. Ges. Wien, xv, p. 615 (1865).
Symplectomorpha, Mik, Wien. Ent. Zeit. v, p. 318 (1886).

Genotype, *Limnobia hybrida*, Mg. (a synonym of *punctipennis*, Mg.); by designation of Westwood (Intr. Class. Ins. ii, Synops. p. 128).

Head: eyes separated above by a broad frons, nearly contiguous below. Proboscis and palpi moderately short. Antennæ 16-jointed, moderately long or somewhat short; if bent backwards they would not reach the root of the wings; scape with 1st joint cylindrical, 2nd shorter and rather broader, both stout; flagellar joints, especially the basal ones, short, oblong or subcylindrical, with moderate verticels. *Thorax* and *abdomen* normal. Male genitalia consisting of two elongate subcylindrical basal pieces with two blunt horny appendages attached to each of them. Ovipositor of female curved, upper valves pointed, the lower ones short. *Legs* rather long, pubescent, in some species conspicuously so; femora in some species distinctly, though moderately, incrassated at tip; middle pair of legs rather shorter than the others; tibiæ

without spurs, ungues small, empodia distinct. *Wings* glabrous, also the veins. Two submarginal cells, four posterior cells, and a discal cell. Auxiliary vein long, ending some distance before the tip of the 1st longitudinal; 2nd vein beginning before the middle of the wing and some distance anterior to the subcostal cross-vein, forking about opposite the tip of the auxiliary vein, the submarginal cross-vein being opposite the latter point; the præfurca a little less than half the full length of the vein; the 3rd vein originating just before the fork of the 2nd vein, close to the anterior cross-vein, which is at the pointed proximal corner of the discal cell; the latter being subtriangular and as long as, or slightly shorter than, the 2nd and 3rd posterior cells; posterior cross-vein distinctly before the fork of the 4th longitudinal; 5th and 6th veins nearly straight; 7th vein conspicuously bisinuate.

Range. Himalayas, Persia, Europe, and North America.

Near *Trimicra*, Os. Sac., but that genus differs from *Symplecta* by the last joints of the antennæ being suddenly and conspicuously reduced in size; moreover, in *Trimicra* the 2nd longitudinal vein issues from the 1st at an acute angle, not in a gentle curve; and the 7th vein is straight. The basal part of the male genitalia is more thickened in *Trimicra*.

Helobia, St. Farg. (1825), antedates *Symplecta* and is synonymous with it, but has not been adopted, the reason not being known to the present author. It does not appear to be preoccupied.

349. **Symplecta punctipennis**, *Mg.* (Pl. IX, fig. 15.)

Limnobia punctipennis, Meigen, Syst. Beschr. i, p. 147, pl. v, figs. 2, 3, 7 (1818).

♂ ♀. *Head* blackish grey, shortly pubescent; frons moderately broad, blackish grey. Proboscis yellowish, palpi blackish. Antennæ dark blackish brown, with a little light pubescence. *Thorax* somewhat elevated; dorsum rather restricted, blackish grey, with a blacker dorsal line from the anterior margin, disappearing gradually before the suture, the space on each side of this line and the sutures narrowly lighter grey; sides of dorsum narrowly yellow; sides of thorax blackish grey, with a narrow yellow line above the hinder pleuræ. Scutellum and posterior corners of mesonotum yellow, the former a little darker at the base; metanotum blackish, basal corners minutely yellow. *Abdomen* dark blackish grey, with a little pale pubescence; posterior margins of segments normally yellowish white on both dorsum and belly in both sexes, but sometimes indistinct or absent. Genitalia of male moderate in size, reddish brown, the claspers bearing some smaller appendages; upper and lower plates short, nearly as broad as the last abdominal segment. Ovipositor normal, of moderate size, brownish yellow. *Legs* blackish or blackish brown; tips of femora slightly but quite distinctly enlarged. *Wings* nearly clear, with very small, blackish infuscations placed as follows:—just below the base of the præ-

furca; on the 1st longitudinal vein (very small) a little beyond the previously mentioned spot; at the tip of the 1st vein; and a small one at the base of the wing between the 4th and 5th longitudinal veins; also narrowly over all the cross-veins. Halteres rather robust, stem yellow, clubs black.

Length 3½–4 millim.

Redescribed from several of both sexes in the Indian Museum, taken as follows: Darjiling, 22–30. ix. 08, captured by me, as well as one (20. ix. 08) taken there "at light"; Darjiling, 5–6. viii. 09 (*Paiva*), and Matiana, Simla district, 8000 feet, 28–30. iv. 07 (*Annandale*). The species occurs also throughout Europe.

Type. The location of this is unknown to me, unless it be in the Meigen collection at Paris.

Genus **GNOPHOMYIA**, *Os. Sac.*

Gnophomyia, Osten Sacken, Proc. Acad. Nat. Sci. Philad. p. 223 (1859).

Furina, Jaennicke, Abhandl. Senck. Ges. vi, p. 318 (1867).

GENOTYPE, *G. tristissima*, Os. Sac., his second species; by designation of Coquillett (1910).

Head: eyes glabrous, nearly contiguous below, but separated above by a broad convex frons. Proboscis short; palpi moderate in size, terminal joint longer. Antennæ 16-jointed, reaching backwards to the root of the wing in both sexes; 1st scapal joint long and cylindrical, 2nd always much shorter, of varying width according to the species; flagellum of elongate subcylindrical joints, shorter in some species and more globose, the length of the verticillate hairs varying with the species. *Thorax* prolonged anteriorly, or shorter, according to the species; suture distinct. *Abdomen* normally elongate, linear, subcylindrical. Genitalia of male consisting of claspers, in which the first joint is much more slender than in *Gonomyia*, the 2nd (horny) joint being in some species almost linear and pointed; a second pair of horny appendages below the first, shorter and stouter. In the female the ovipositor is peculiarly formed, the upper valves being incrassated and arcuate on the lower side towards the base, the lower pair being very short, about half the length of the upper ones, the whole ovipositor having thus rather an unusual appearance. *Legs* long and slender, microscopically pubescent; tibiæ without spurs; empodia distinct; middle pair of legs rather shorter than the others. *Wings* normally glabrous.* Two submarginal cells, four posterior cells; discal cell open or closed. The auxiliary vein ending at a good distance beyond the origin of the 2nd vein, with the subcostal cross-vein a little more or less distant from its tip. The 2nd longitudinal begins about the middle of the wing, forming a moderate angle, the præfurca, which often turns abruptly upward just beyond its middle, generally about half the length of

* In at least one foreign species (*G. luctuosa*, from North America) microscopic pubescence occurs towards the tip of the wing.

the vein but sometimes much shorter; the marginal cross-vein near the inner end of the 1st submarginal cell, or at about the middle of it, occasionally exactly at the fork of the 2nd vein, and, in rare cases, absent altogether;* the 3rd vein generally originating from the angle in the præfurca, being almost (apparently) a continuation of the basal section of the præfurca, and curved downwards towards its tip;† the anterior cross-vein immediately beyond the origin of the 3rd vein, moderately long, joining the upper basal corner of the discal cell, which latter is oblong, with pointed ends, the posterior cross-vein being situated before the middle of it; the 5th, 6th, and 7th veins gently curved towards their tips.

Range. Europe, South and East Africa, Australia, New Zealand, North and South America and the Orient.

Table of Species.

1. Wings wholly unmarked, of normal length; antennæ not 15-jointed	2.
Wings with several conspicuous brown marks, considerably longer than the abdomen; antennæ 15-jointed	*longipennis*, sp. n., p. 489.
2. Marginal cross-vein present‡	3.
Marginal cross-vein absent; anterior branch of 4th longitudinal vein forked, posterior branch simple; discal cell open, coalescent with 3rd posterior cell; posterior cross-vein at base of 3rd posterior cell; a dark blackish species with distinct black veins in the wing ..	*nigra*, sp. n., p. 494.
3. Marginal cross-vein exactly at the foot of the 2nd longitudinal vein (or even very slightly before it); genital organs of male very large and conspicuous; antennæ 13-jointed..........................	*genitalis*, sp. n., p. 490.

* The marginal cross-vein is very inconstant, even in the same species, both as regards its exact position and its presence or absence, as Osten Sacken mentions a German species of which many specimens were seen by him without it, although normally it should have been present in that species. In this species, too, the abdomen is more clubbed at the tip, and the genitalia are of different construction. He also possessed another species, from Italy, in which there was no marginal vein at all, and the discal cell was open, being coalescent with the 3rd posterior cell. This species he thought might be *Erioptera lateralis*, Mcq., but it is to be noted that in Prof. Kertész's recent 'Catalogue of Diptera' *lateralis* is referred to *Gonomyia*. It is, of course, possible that Osten Sacken's identification of the species was erroneous.

The fact that the marginal vein is occasionally absent in this genus may be considered likely to cause confusion between it and *Gonomyia*, the species having considerable resemblance to one another, but in the present genus the branches of the 2nd longitudinal vein (which is always forked) are much too approximately parallel to be readily confounded with the very widely opened fork of *Gonomyia*.

† Exceptions occur; for instance, in *G. flavomarginata*, Brun., a comparatively long basal rectangular section is present.

‡ This cross-vein is occasionally absent, but no better or more reliable distinctive character is available. Such exceptions must be allowed for in determining specimens.

Marginal cross-vein distinctly beyond the fork of the 2nd vein, either at a moderately short distance beyond, or very considerably beyond it; antennæ not 13-jointed .... 4.

4. Marginal cross-vein a little, but distinctly, beyond the fork of the 2nd vein; præfurca about half the length of the vein, originating normally at an acute angle or in a gentle curve; discal cell present .. 5.

Marginal cross-vein at middle of upper branch of 2nd longitudinal vein; præfurca less than half the length of the 2nd vein, arising abruptly in a distinctly rounded angle .... 6.

5. Anterior branch of 4th longitudinal vein forked; a pale yellow slender species with yellow wings .... *furcata*, sp. n., p. 491.

Anterior branch of 4th vein simple; robust black species with distinct black veins in wing .... *strenua*, sp. n., p. 492.

6. Both branches of 4th longitudinal vein forked .... *aperta*, sp. n., p. 492.

Upper branch of 4th longitudinal vein simple .... *incompleta*, sp. n., p. 493.

350. Gnophomyia longipennis, sp. nov. (Pl. IX, fig. 17.)

♀. *Head* brownish grey; proboscis and palpi dark. Antennæ brownish yellow, 15-jointed; scapal joints normal, 1st subcylindrical, long, 2nd much shorter, barely wider; 1st flagellar joint elongated, much narrowed at base, followed by eleven subequal oval joints and a long thin apical one. *Thorax*: dorsum brown, with the usual three dark stripes indistinctly defined; the posterior part of the thorax, scutellum, and metanotum more reddish brown, also the sides. *Abdomen* dull brownish yellow, blackish towards tip, and with a blackish lateral stripe; belly brownish yellow. Ovipositor rather shortened, reddish yellow. *Legs* uniformly brownish yellow, tarsi barely darker. *Wings* very pale grey, much longer than the abdomen, highly iridescent, with pale brown marks. Auxiliary vein long; subcostal cross-vein some distance before the beginning of the 2nd longitudinal, which originates at the middle of the wing in a strong curve, the præfurca much less than half the length of the vein, the forks of which are nearly parallel; the distinct marginal cross-vein placed at the middle of the upper branch; the 3rd longitudinal vein bent sharply at a right angle near its base, thence running straight to the wing-tip; both branches of the 4th vein forked, rather widely, the front branch beyond and the hinder branch before its middle; discal cell open, coalescent with 3rd posterior cell, the base of which is pointed; posterior cross-vein beyond the base of the 3rd posterior cell; 5th, 6th, and 7th veins nearly straight. The wing-markings are

pale brown and consist of a long, moderately dark brown stigma filling the marginal cell from the marginal cross-vein, proximally; the suffusion spreads over all the cross-veins, rather paling in intensity, till it reaches and embraces the posterior cross-vein; two quite round spots on the costa, over the subcostal cross-vein and the base of the 2nd vein; a round spot at the tip of the 1st submarginal cell, embracing the tip of the anterior branch of the 2nd vein; and the tips of all the veins except the 3rd and the 6th.

Length 5 millim.

Described from a single perfect female from Dhakuri, Kumaon district, 8900 feet (*A. D. Imms*).

Type in the Indian Museum.

A striking abnormality in this species, which is a very conspicuous and pretty one, is the 15-jointed antenna. I refrain from establishing a new genus on the strength of this feature alone.

351. **Gnophomyia genitalis**, sp. nov. (Pl. IX, fig. 16.)

♂ ♀. *Head*: vertex and frons ash-grey, the latter one-fourth the width of the head in the male, more than a third in the female. Antennæ light brown, 13-jointed; scapal joints normal; 1st joint of the flagellum very long and as wide as the 2nd scapal joint, flattened; the remaining flagellar joints oval, verticillate and closely pubescent, the last one (the eleventh) with thicker pubescence and three stiff hairs at tip. *Thorax* wholly light brownish grey, including scutellum, metanotum and the sides. *Abdomen* light brownish grey, with pale grey pubescence. Genitalia of male very large and conspicuous; the 1st joint of the claspers long, cylindro-ovate, grey, highly pubescent; the 2nd joint bifid, composed of a long, slightly sinuate, shining brown, narrow, hook-tipped piece, and a rather shorter and softer, broader palp-like piece; a small dorsal grey plate, with long reddish yellow hairs on the hind margin. Ovipositor normal, brownish yellow. *Legs* brown, coxæ yellowish; all the legs yellowish in the female. *Wings* very pale grey. Auxiliary vein ending at a little beyond the middle of the wing; subcostal cross-vein exactly at its tip, both lying very close to the costa; the 1st longitudinal vein ending some distance beyond; the 2nd vein beginning before the middle of the wing, divided by the origin of the 3rd vein and the fork of the 2nd into three about equal lengths, the præfurca thus being two-thirds the length of the vein, the branches of the fork gently diverging; marginal cross-vein exactly at, or very slightly before, the fork of the 2nd vein; the 3rd vein beginning at the end of the 1st third of the 2nd vein; discal cell much narrower at base; anterior branch of the 4th vein forked shortly but widely near the tip; posterior cross-vein near the middle of

the discal vein; the 5th, 6th, and 7th veins nearly straight, all gently curved at the tip.

Length 5 millim.

Described from a single male and female taken at Bhowali, Kumaon district, 5700 feet, 27. vi. 10 (*A. D. Imms*).

Types in the Indian Museum.

352. **Gnophomyia furcata**, sp. nov. (Pl. IX, fig. 18.)

♂ ♀. *Head*: occiput blackish grey. Proboscis and palpi dark brown. Antennæ yellowish brown, the colour varying in intensity, with sparse pale pubescence. Neck yellowish brown. *Thorax* light yellowish brown, shining, dorsum with a few pale hairs; sides of thorax more or less shining yellowish brown. Scutellum and metanotum shining yellowish brown. *Abdomen* brownish yellow, with some pale pubescence; rather darker brown in female. Belly lighter. Genitalia of both sexes yellowish. *Legs* pale yellowish, tarsi darker. *Wings* practically clear, slightly iridescent; stigma very indistinct, yellowish grey. Auxiliary vein ending considerably beyond the origin of the 2nd longitudinal, the subcostal cross-vein being towards the tip of the former; the 2nd vein forked much sooner than in *Gonomyia*, the branches diverging, the posterior one slightly the longer, the anterior one joined (at about one-third of its length) to the 1st longitudinal (near the tip of the latter) by the marginal vein, which in some specimens is indistinct; the 3rd longitudinal with a short basal portion, the rest being straight and parallel to the vein above it; anterior cross-vein moderately long; discal cell closed, sub-triangular, its inner side very short; anterior branch of 4th vein widely forked beyond half its length; 5th, 6th and 7th veins nearly straight, with the exception of the small downward curve of each towards its tip; 1st posterior cell twice as wide at base as at tip. Halteres pale yellow.

Length 3–3½ millim.

Described from several specimens of each sex in the Indian Museum, from Darjiling, 7000 ft., 5–10. viii. 09 (*Paiva*).

Types in the Indian Museum.

In the forking of the anterior branch of the 4th vein this species differs from others in this genus, so far as I am aware, yet it undoubtedly belongs here. I refrain from establishing a new genus on this character alone, in view of the variable nature of the venation in the closely allied genus *Gonomyia*, and the tendency to specific and adventitious variation in allied genera. Besides, Osten Sacken in describing his two North American species, *G. luctuosa* and *tristissima*, notes a difference of venation in them. The wing of the present species differs somewhat from Osten Sacken's plate (Monog. N. Am. Dipt. iv, pl. ii, fig. 5) as in that (*G. tristissima*) the marginal vein occurs at the fork of the 2nd vein, the contact of the 3rd longitudinal vein with the 2nd is

almost punctiform, and the anterior branch of the 4th vein is not forked. In the event of other species being discovered showing consistency in these variations, a new genus might well be founded for them.

353. **Gnophomyia strenua**, sp. nov. (Pl. IX, fig. 19.)

♀. *Head* blackish grey; frons wide, widening towards vertex, yellowish grey at the sides, the middle part broadly black, and somewhat convex. Antennæ rather dark brownish yellow; joints of flagellum considerably elongate, with pale microscopic pubescence, and brown hairs of greater length. Proboscis stout, dark shining brown, pubescent; palpi nearly black, pubescent. *Thorax*: dorsum very dark brown, barely shining; shoulders narrowly yellowish, with a brown streak; suture and post-sutural depression narrowly greyish. Scutellum and metanotum lighter brown and more shining; sides of thorax blackish brown, more or less shining. *Abdomen* dark brown, with sparse pale pubescence; belly similar. Ovipositor of the same colour, tip yellow. *Legs* pale yellowish; tips of femora and tibiæ, and the tarsi towards the apical part, blackish. *Wings* yellowish grey, wholly unmarked. Auxiliary vein ending opposite the marginal vein; the 2nd longitudinal vein beginning at some distance before the middle of the wing; the præfurca less in length than the remainder of the vein, distinctly elbowed at the origin of the 3rd vein, which is not bent at its base, springing in a straight line from the tip of the junction of the anterior cross-vein with the 2nd vein; the 2nd vein forking soon after the elbow; marginal vein situated very soon after the fork, joining the 1st vein some distance before the tip of the latter; the 3rd vein almost wholly straight; anterior cross-vein twice the length of the proximal side of the discal cell, which is somewhat elongate, much broader distally, the posterior cross-vein being situated a little before its middle; the two branches of the 2nd vein, the 3rd vein, and the upper branch of the 4th vein, approximately parallel; the 5th and 6th veins nearly straight, 7th gently bisinuate. Halteres black.

Length 5 millim.

Described from a single female from Kurseong, 5. ix. 09 (*Annandale*).

Type in the Indian Museum.

354. **Gnophomyia aperta**, sp. nov. (Pl. X, fig. 1.)

♂. *Head* light grey; frons moderately broad, the middle part blackish; vertex with stiff bristly yellow hairs; back of head light grey. The 1st scapal joint with bluish grey dusting, 2nd rather large, yellowish; flagellum much narrower than scape, blackish brown; pubescence sparse. Proboscis and palpi dark brown. *Thorax* moderately dark ash-grey; the three usual stripes are present, brown, the median one reaching from the anterior margin nearly to the suture, being narrowly bifid behind;

the side stripes short, pointed in front; rest of dorsum concolorous, grey, with two indistinct brownish spots behind the suture. Scutellum grey; metanotum and sides of thorax grey. *Abdomen* light brownish grey, barely pubescent; belly similar. Genitalia small, blackish. *Legs* uniformly pale brown; coxæ darker at base, slightly dusted with bluish grey. *Wings* clear, very iridescent. Auxiliary vein ending towards the tip of the 1st vein; the 2nd vein beginning just beyond the middle of the wing; præfurca only half as long as the lower branch, the 3rd vein springing from an angle in it, just beyond its middle; marginal vein situated in middle of upper branch of 2nd vein, joined to tip of 1st vein; basal portion of 3rd vein nearly as long as the anterior cross-vein; discal cell absent; upper branch of 4th vein forked near its tip; lower branch springing simultaneously with the upper from the end of the anterior cross-vein, and forking before half its length; posterior cross-vein just beyond the bifurcation of the 4th vein. Halteres very long, thin, yellow.

Length 3½ millim.

Described from a single specimen, Darjiling, 8. viii. 09 (*Paiva*).

Type in the Indian Museum.

355. **Gnophomyia incompleta**, sp. nov. (Pl. X, fig. 2.)

♂. *Head* grey; proboscis and palpi brown, pubescent; antennal scape brownish yellow, flagellum dark brown. *Thorax* light grey; the three usual stripes distinctly present, but not conspicuous, slightly darker grey; the dorsum behind the suture also of the same shade. Scutellum and metanotum whitish grey, especially when viewed from behind; sides of thorax dark grey with a slight brownish tinge. *Abdomen* blackish grey; segments distinct, nearly bare; belly similar. Genitalia small, concealed. *Legs*: coxæ and basal part of femora brownish yellow, the colour quickly darkening towards the tips of the femora to blackish, the rest of the legs being of the latter colour. *Wings* clear, iridescent. Auxiliary vein ending before the beginning of the 2nd longitudinal, which begins distinctly beyond the middle of the wing, the præfurca taking a considerable downward curve, and the 3rd vein issuing from its lowest point; the 2nd vein forking soon after; the whole præfurca nearly as long as the lower branch of the 2nd vein; the marginal cross-vein placed at two-thirds of the length of the marginal cell, uniting with the absolute tip of the 1st longitudinal; the 3rd vein with no distinct basal section and parallel with the upper branch of the 4th vein; the anterior cross-vein moderately long, joining the 4th vein at its fork; discal cell open; lower branch of 4th vein forked at half its length, the posterior cross-vein just beyond that fork. Stigma light brown, small, oval, placed around the tip of the 1st vein. Halteres blackish.

Length 3¾ millim.

Described from one male from Kurseong, 7. ix. 09 (*Annandale*).

Type in the Indian Museum.

356. **Gnophomyia nigra**, sp. nov. (Pl. X, fig. 3.)

♀. *Head*: the broad vertex and frons (with long bristly hairs), the proboscis and palpi, and the antennæ, all dark brownish yellow; the 2nd scapal joint barely wider than the flagellar joints. *Thorax* blackish, the lateral margins of the dorsum and the posterior corners narrowly yellowish; sides blackish. Scutellum with a little reddish brown towards the edge, metanotum blackish. *Abdomen* rather short and stout, dark brown, wrinkled, with pale brown pubescence; belly similar. Ovipositor small, consisting of two conical thick grey pubescent pieces. *Legs* dark brown, femora a little yellowish towards the base. *Wings* yellowish grey, veins black and very distinct. Auxiliary vein ending at middle of wing; 1st longitudinal vein ending a little way beyond it; the 2nd vein beginning before the middle of the wing, the præfurca gently curved, forming half the length of the vein, which forks rather widely; no marginal cross-vein; the 3rd longitudinal vein beginning a little before the fork of the 2nd at a rectangle, in a line with, and about as long as, the anterior cross-vein; discal cell absent, being coalescent with 3rd posterior cell; anterior branch of 4th vein forked before one-third of its length; posterior cross-vein in a line with the base of the 3rd posterior cell; the 5th and 6th veins nearly straight, the 7th gently curved. Halteres blackish.

Length 5 millim.

Described from a type female from the Bhim Tal, 4500 feet, Kumaon, 22–27. ix. 06 (*Annandale*); and one from the Nilgiri Hills, 3000 ft., iv. 10 (*Andrewes*).

Type and second specimen in the Indian Museum.

I do not hesitate to include this species in *Gnophomyia*, in spite of the absent marginal cross-vein, the presence of which is regarded as a generic character, because its whole appearance is that of this genus, the species both in general "facies" and in the distinct black veins closely resembling *G. strenua*; because the forking of the 2nd longitudinal vein is that of *Gnophomyia* (*i. e.*, the branches gently diverging or nearly parallel), and not that of *Gonomyia* in which the branches very widely diverge; and because Osten Sacken has already drawn attention (Monog. N. Amer. Tip. p. 173) to an undescribed species from Germany and a single example of another species from Italy, both seen by him, and in both of which the marginal cross-vein was absent. It seems therefore likely that this character is also as plastic as many others in the ERIOPTERINI.

Genus **DASYMALLOMYIA**, *Brun.*

Dasymallomyia, Brunetti, Rec. Ind. Mus. vi, p. 304 (1911).

GENOTYPE, *D. signata*, Brun.; by original designation.

Head, *thorax* and *abdomen* of the normal Eriopterinid type, with light conspicuous hairs on thorax and abdomen. Eyes

separated above by a hairy frons, less than one-third the width of the head, contiguous below for a short space. Antennæ missing, except the scape, which is normal but rather less in size, and the three basal joints of the flagellum, which also have every appearance of normality, being rounded and verticillate. Abdomen narrowed at base, widened beyond the middle; genitalia of moderate size, normal. *Legs* conspicuously pubescent throughout with moderately long hairs. *Wings* moderately broad, anal angle rounded but distinct; two submarginal cells, four posterior cells; discal cell open, being coalescent with the 3rd posterior cell. Auxiliary vein lying close to 1st longitudinal, ending at about the middle of the wing, the 1st longitudinal ending a little beyond; the 2nd longitudinal beginning at one-third of the wing, forked; marginal cross-vein just before tip of 1st vein; the 3rd vein beginning a little before the fork of the 2nd; the 4th forking close to the anterior cross-vein, both branches forked; posterior cross-vein just beyond fork of 4th vein; 3rd posterior cell pointed at base, 6th and 7th veins slightly sinuous.

Range. Darjiling district.

Although this genus stands out as quite distinct from others, it is difficult to define its peculiar characters. Perhaps the robustness of the body (affording some general resemblance to *Teucholabis*), the narrowed abdomen near the base, and especially the somewhat shortened, thickened, very hairy legs, are the best distinguishing features from *Gnophomyia*, Os. Sac., which seems to be its nearest Eastern ally.

357. Dasymallomyia signata, *Brun.* (Pl. X, fig. 4.)

Dasymallomyia signata, Brunetti, Rec. Ind. Mus. vi, p. 304 (1911).

♀. *Head*: frons forming one-fourth the width of the head, grey, with some long, rather shaggy yellow hairs; back of head similar. Proboscis brownish yellow, short, rather stump-like; palpi normal, elongate, four-jointed, pubescent. Antennæ with apparently two scapal joints nearly alike, rather short, slightly wider at the tip, the flagellar joints oval (only three are remaining, the rest being broken off); scape dark, flagellum brownish yellow. *Thorax*: dorsum yellowish; a moderately broad, very shining black stripe in the middle from the anterior margin to the suture, slightly narrowed in front; a short, very shining, black stripe on each side of the median one, with an isolated black spot in front of it near the shoulders; behind the suture, near the dorsal margin on each side is a very black shining triangular spot, and on the dorsum (behind the suture) a pair of normal wide blackish stripes reaching to the scutellum, which latter is small and yellow, with the base a little blackish. Sides of thorax with a pinkish tinge; some short yellow hair on the pleuræ and near the wing-roots; metanotum blackish. Prothorax moderately large, produced into a short stout neck. *Abdomen* black, roughened; posterior

margins of segments narrowly pale yellowish; belly similar. Ovipositor brownish yellow, enlarged at the base, the lower pair of valves much shorter than the upper ones, straight, and set a little further back. *Legs*: coxæ and trochanters both somewhat small; legs comparatively robust, yellow, with rather long close pubescence; the femora a little incrassated at the tip, and bearing a subapical blackish not very well-defined ring; tips of tibiæ and tarsal joints narrowly blackish. *Wings* nearly clear, very iridescent, with a faint yellowish appearance caused by the yellow veins; the "cross-veins" rather black. Auxiliary vein lying close to the 1st longitudinal vein, ending at about the middle of the wing, the 1st longitudinal ending a little beyond; the 2nd longitudinal vein beginning at one-third of the wing, and forking at about half its length, just below the tip of the 1st vein, with the marginal cross-vein just before the tip of the latter; the 3rd longitudinal vein originating a little before the fork of the 2nd, at a right angle, thence forming nearly another right angle before proceeding almost straight to the border, parallel with the veins in front of and behind it; basal section of 3rd vein fairly long, nearly in a line with the anterior cross-vein, which is of about the same length; the 4th vein forking close to the anterior cross-vein, the upper branch forking at about its middle, the branches parallel; the lower branch of the 4th vein simple, parallel with the 5th; posterior cross-vein just beyond fork of 4th vein; 3rd posterior cell pointed at base; 6th and 7th veins slightly sinuous. A small indistinct stigma over the tip of the 1st vein.

Length 7½ millim. to tip of ovipositor.

Described from a single female in the Indian Museum from Kurseong, 7. ix. 09 (*D. F. Lynch*).

Genus **CONOSIA**, *Wulp*.

Conosia, Wulp, Tijd. Entom. xxiii, p. 159, pl. x, figs. 5–7 (1880).

Genotype, *Limnobia irrorata*, Wied.; by original designation.

Head relatively very small, very flat and broad. Occiput greatly produced backward in an obtuse form, the vertical hump continued backward also, well defined, to the hinder limit of the head, the occiput being practically in a plane with the vertex. Eyes oval, contiguous below for a considerable distance, widely separated above in both sexes by a broad frons which is longitudinally conspicuously humped. Antennæ barely longer than the head; the 1st scapal joint long, thick, cylindrical, the 2nd broader and shorter, both robust; flagellum of twelve joints, with the 1st joint stout at the base, the remainder very filiform, pubescent. Proboscis short; palpi short, four-jointed. *Thorax*: anterior part of dorsum conspicuously produced forward over the prothorax and head in a conical obtuse form; transverse suture rather less distinct than usual. Scutellum small, metanotum well developed. *Abdomen* long, cylindrical, four times as long as the

thorax; tip obtuse in male, pointed in female. Genitalia of male small and inconspicuous. *Legs* long and slender, microscopically pubescent. *Wings* very much shorter than the abdomen, comparatively broad, bare of pubescence. Two submarginal, five posterior cells, and a discal cell; *anterior cross-vein distinctly beyond the discal cell*; auxiliary vein ending beyond middle of wing, the 1st longitudinal ending just beyond it; 2nd vein beginning before middle of wing, forking at about half its length, the marginal cross-vein just beyond the fork; the 3rd vein begins at the fork of the 2nd, gently bisinuate; the 4th vein with upper branch forked well beyond the discal cell, the lower branch forked at distal end of that cell, which latter is pentagonal; anterior cross-vein distinctly beyond discal cell, posterior cross-vein before its middle, oblique; 5th, 6th and 7th longitudinal veins nearly straight; anal angle of wing somewhat rounded.

Range. The Orient, China, Japan, and Australia.

The most pertinent characters of this genus, which possesses but a single widely distributed species, are the conical production of the thoracic dorsum over the head, and the position of the anterior cross-vein distinctly beyond the discal cell.

358. Conosia irrorata, *Wied.* (Pl. X, fig. 5.)

Limnobia irrorata, Wiedemann, Ausser. Zweifl. i, p. 574 (1828).
Limnobia substituta, Walker, List Dipt. Brit. Mus. i, p. 39 (1848).
Limnophila crux, Doleschall, Nat. Tijds. Ned. Ind. xiv, p. 388, pl. iv, fig. 3 (1857).

♂ ♀. *Head*: eyes well separated above, contiguous below for a short distance; from vertex to back of head rather bright yellowish grey. Proboscis and palpi brownish yellow or brown,

Fig. 43.—*Conosia irrorata*, Wied., lateral view of head and thorax.

both short. The 1st scapal joint of antennæ cylindrical, elongated, with some stiff hairs, 2nd joint short, but of good size, rounded, with very few hairs; the 1st flagellar joint obconical, with microscopic grey pubescence, smaller than 2nd scapal joint but much larger than the other flagellar joints, the basal ones of which in the male are shortly cylindrical, the remainder elongated, all with a few very long hairs each, the shorter pubescence being more pronounced on the basal joints. In the female all the flagellar joints after the 1st are uniformly shortly cylindrical, all bearing

short pubescence. *Thorax* of male from yellowish grey to rather dark brownish yellow; a rather broad brown median line, with a row of about nine or ten small dark brown spots on each side of it; a narrow median line is present on the concolorous scutellum, which is furnished with moderately long golden yellow hairs on the posterior margin; posterior corners of dorsum with a few similar yellow hairs and a few are placed in front of the scutellum; a less distinct grey stripe on each side of the median one, beginning some distance behind the shoulder and interrupted at the suture, behind which it takes the form of a spot and a pointed elongated stripe which attains the posterior margin; on the rest of the dorsum and towards and on the sides (which are concolorous) are small spots and marks irregularly placed; metanotum rather more grey than yellow, with traces of a dark median line. In the female, on each side of the narrow median thoracic stripe is a close series of irregularly placed small brown spots, two or three abreast, reaching from the anterior margin to the suture; there is also a patch of similar spots towards each side, in front of the wing. *Abdomen* yellowish or brownish yellow, the segments clearly emarginated, with short yellow hairs at the sides; a narrow black stripe often rnns along each side of the dorsum; belly yellowish. Genitalia of male consisting of an upper plate, a pair of thick brown claspers marked with small brown spots and bearing golden-yellow hairs, terminating each in a bifid yellow claw; there is also a pair of internal spine-like yellow organs. In the female the abdomen is darker brown, the ovipositor reddish yellow. *Legs* uniformly yellow, with distinct yellow pubescence; claws black. *Wings* yellowish grey. Auxiliary vein ending a little before tip of 1st longitudinal vein, both being distinctly beyond the middle of the wing; the 2nd vein originates much before middle of wing, forking in a peculiar manner just below tip of 1st vein; the upper branch apparently springs at a right angle from the lower one (which latter is in a straight line with the præfurca), thus having the appearance of a cross-vein, then turns suddenly outward, running parallel with the lower branch; præfurca longer than upper branch, but distinctly shorter than lower one; marginal cross-vein very oblique, uniting the 1st vein (at a little before its tip) with the angle made by the upper branch of the 2nd vein; basal portion of 3rd vein obliquely placed, straight in itself, appearing almost as a cross-vein, nearly twice as long as anterior cross-vein, which latter is also very abnormally placed, being distinctly beyond the discal cell; discal cell cylindro-conical; anterior branch of 4th vein forked half-way between the discal cell and wing-margin, the branches parallel, as are all the veins, practically, with the exception of the branches of the 2nd vein, which distinctly diverge at their extremities; discal cell rather more than half as long as the 3rd and 4th posterior cells, both of which are equal in length; posterior cross-vein placed at the first third of the discal cell. In colouring the anterior margin of the wing is more or less broadly brown, but the pattern varies in detail;

in some specimens the costal cell is nearly clear, but occupied throughout its entire length with brown spots, some confluent, especially in the neighbourhood of the stigma, beyond which the costal part of the wing is mainly brown or brownish; the wing is brownish down to the 2nd longitudinal vein; the whole of the veins in the clear part of the wing bearing a row of minute dark brown spots, which in some examples are considerably fainter than in others; the brownish colour extending from the costal cell is generally somewhat enlarged over the base of the 2nd vein and below the stigma, and the cross-veins are sometimes suffused with grey. In some individuals the tips of the veins on the posterior margin of the wing are slightly infuscated, the 7th having often a distinct dark grey spot of moderate size at its tip.

Length 5–12 millim., without ovipositor.

Redescribed from a considerable number of both sexes in the Indian Museum, the Pusa collection and my own, from Calcutta, Darjiling, and other parts of India, Assam, Rangoon, and from Java. The species extends throughout the whole of the Orient, occurring also in China, Japan, and Australia.

Type presumably in Westermann's collection in the Vienna Museum.

In one specimen in the Indian Museum collection there is a supernumerary cross-vein in the 2nd basal cell, a little before the posterior cross-vein. This is probably the most widely distributed species of the family in the East.

Genus CLADURA, *Os. Sac.*

Cladura, Osten Sacken, Proc. Acad. Nat. Sci. Philad., 1859, p. 229.

GENOTYPE, *Cladura flavoferruginea*, Os. Sac.; by original designation.

Head: eyes separated above by a moderately broad, distinctly convex frons; nearly contiguous below. Proboscis short; palpi short, last joint robust. Antennæ 16-jointed, just reaching the root of the wings; scape with 1st joint subcylindrical, of moderate length, 2nd joint shorter and broader; flagellar joints subcylindrical, slightly incrassated at base, verticels of moderate length. *Thorax* and neck normal. *Abdomen* with "the upperside of the ultimate segment horny, convex, having a rounded excision between two projecting points on its posterior margin" (*Osten Sacken*). The male genital organs consist of a long cylindrical basal joint, the terminal appendages being very small and filiform. The female ovipositor has flattened, rather broad valves. *Legs* of considerable or of moderate length, pubescent; tibiæ without spurs; empodia distinct, ungues smooth on the underside. *Wings* somewhat narrow and rather long, glabrous; veins on apical part of wing bearing a distinct though short pubescence. Two sub-

marginal cells, five posterior cells, and a discal cell. Auxiliary vein ending at some distance beyond the middle of the wing, at, or a little beyond, the inner end of the 1st submarginal cell; the latter cell shorter than the 2nd submarginal, its petiole about equal to the length from the fork to the (sometimes indistinct) marginal cross-vein, which is placed beyond the middle of the marginal cell or just at the fork; subcostal cross-vein shortly before the tip of the auxiliary vein, joining the 1st longitudinal, which ends some distance beyond the auxiliary vein; the 2nd vein begins distinctly before the middle of the wing, the well arcuated præfurca about equal in length to the lower branch; an additional cross-vein (in at least one North American species) occasionally found in the 2nd submarginal cell; 3rd vein originating rather sharply from the 2nd just anterior to the fork, practically straight, its base, the anterior cross-vein, and the basal side of the discal cell more or less in a line; discal cell pentagonal, broader distally, its basal end rectangular, its distal sides forming an angle. "The pentagonal shape of the discal cell plainly shows that it is the forking of the posterior branch of the 4th vein which forms one of its sides" (*Osten Sacken*). Five posterior cells, of which the 1st is subequal to the 2nd submarginal in length, the 2nd varies in shape with the species, the 3rd and 4th are subequal, the 5th normal; posterior cross-vein a little before or after the base of the discal cell; the 5th, 6th, and 7th longitudinal veins nearly straight.

Range. Previously known only from North America.

The characters which distinguish this genus from the allied genera, *Paracladura* and *Claduroides*, may best be shown by the following table :—

A. Subcostal cross-vein placed near the tip of the auxiliary vein. Discal cell present, its proximal end rectangular. Antennal scape long, normal; flagellum of fourteen oval joints. The 7th longitudinal vein normal .... CLADURA, Os. Sac.*

AA. Subcostal cross-vein placed very far before the tip of the auxiliary vein, just after the origin of the 2nd vein, near the middle of the wing.

B. The 1st longitudinal vein nearly as long as the anterior branch of the 2nd vein, ending close to it near the wing-tip. Marginal cross-vein placed soon after the fork of the 2nd vein, at a considerable distance from the tip of the 1st vein.

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* See my "Revis. Orient. TIPULIDÆ" (Rec. Ind. Mus. vi, p. 285) with regard to *Cladoneura*, a fossil genus figured by Needham, which appears to have been the immediate ancestor of this group of genera.

Discal cell present, its proximal end pointed. Antennal scape very short, the joints almost annular; flagellum of fifteen very elongate joints. The 7th longitudinal vein less than half the length of the 6th, turning sharply into the margin at its tip .... PARACLADURA, Brun.

BB. The 1st longitudinal vein ends (turning sharply up to the costa) just beyond the tip of the auxiliary vein and some distance from the tip of the anterior branch of the 2nd vein, also a considerable distance from the wing-tip. Marginal cross-vein at the tip of the 1st longitudinal vein. Discal cell absent, coalescent with the 2nd posterior cell, the proximal end of which is pointed. Antennal scape normal (long), flagellum of thirteen oval joints. The 7th longitudinal vein normal, as in *Cladura* .... CLADUROIDES, Brun.

359. **Cladura flavescens**, *Brun.* (Pl. X, fig. 6.)

Cladura flavescens, Brunetti, Rec. Ind. Mus. vi, p. 284 (1911).

♂ ♀. *Head:* frons broad, more than one-third the width of the head, vertex convex, both brownish yellow; back of head concolorous, with long stiff brown hairs. Proboscis brownish yellow, palpi a little darker. Antennal scape brownish yellow; 1st scapal joint moderately long and stout, subcylindrical, 2nd joint shorter and broader; flagellum of fourteen oval joints, gradually diminishing in breadth but increasing in length as the tip of the antennæ is reached; with minute whitish pubescence, each joint having a single verticel of apparently three or four long hairs. *Thorax* elongate and rather convex above, produced forward into a distinct, but short, stout neck. Brownish yellow, shining, unmarked; some black hairs on the posterior part of dorsum above the wings. Scutellum and metanotum concolorous, the former with a few hairs; sides of thorax brownish yellow. *Abdomen* of male yellowish brown, with sparse pale yellow hairs; in female dark brown on dorsum, yellowish on belly. Genitalia of male brownish yellow (not easily seen, as the claspers in the single male are tightly closed), apparently consisting of the normal pair of claspers, of which only the thick subconical basal joint can be seen. In the female the ovipositor is brownish yellow, rather long, conically produced at the base, to which are attached two pairs of nearly straight, elongate valves, the lower pair being much shorter and twisted round somewhat to the side. *Legs* uniformly brownish yellow, slightly darker towards the tips of the tarsi. *Wings* pale yellowish grey, moderately iridescent,

unmarked. Auxiliary vein ending at some distance beyond the middle of the wing, the subcostal cross-vein placed shortly before its tip, connecting it with the 1st longitudinal, which latter ends a little before half the distance between the tip of the auxiliary vein and the tip of the wing; the 2nd vein begins distinctly before the middle of the wing, well arcuated, forking before the tip of the 1st vein; the præfurca fully as long as the lower branch; the marginal cross-vein, which is not very distinct, but obviously present, placed just at the fork of the 2nd vein, the upper branch of which is a good deal shorter than the lower one; 3rd vein originating at right angles from a little anterior to the fork of the 2nd, its basal part short (shorter than the anterior cross-vein), thence running straight to just below the wing-tip, anterior cross-vein and base of discal cell practically in a line with the basal part of the 3rd vein; discal cell pentagonal, much broader distally, its proximal side somewhat oblique, about as long as the 4th posterior cell; anterior branch of 4th vein forked near tip, making five posterior cells, of which the 1st is of the same length as the 2nd submarginal, the 2nd is triangular, the 3rd and 4th subequal, the 5th normal, the posterior cross-vein being situated a little before the middle of the discal cell; the 5th, 6th, and 7th longitudinal veins nearly straight. Halteres pale brownish yellow.

Length 3–3¼ millim.

Described from a single specimen of each sex taken, respectively, 7. viii. 09 and 6. viii. 09. at Darjiling (*Paiva*).

Types in the Indian Museum.

The wing agrees exactly with that of the North American species *C. indivisa*, Os. Sac., except that the marginal cross-vein in my species is a little more proximal and the 2nd posterior cell is triangular, instead of what may be described as attenuated bell-shaped, as in *indivisa*. Incidentally this figure shows no subcostal cross-vein, which, however, is distinctly present in *C. flavescens*, placed, as stated by Osten Sacken, near the tip of the auxiliary vein.

Genus **PARACLADURA** *Brun.* (Pl. X, figs. 9, 10.)

Paracladura, Brunetti, Rec. Ind. Mus. vi, p. 286 (1911).

GENOTYPE, *Paracladura gracilis*, Brun.; by original designation.

Two submarginal cells, five posterior cells, a discal cell.

Differing from *Cladura* in the face being distinctly though not conspicuously gibbous. The antennæ are of a totally different construction altogether; the scapal joints both being very short, subglobular, no longer than broad, whilst the flagellum is composed of fifteen joints, a very unusual number throughout the family

TIPULIDÆ. All the joints are very elongated, minutely pubescent. The whole antenna if bent backwards would reach the basal segments of the abdomen. The venation affords several very marked differential characters. The subcostal cross-vein is situated a long distance before the tip of the auxiliary vein, only a short distance beyond the base of the 2nd longitudinal. The auxiliary vein ends gradually in the costa at about two-thirds the length of the wing. The 1st longitudinal vein is very long, following the line of the costa nearly to the tip of the upper branch of the 2nd longitudinal vein, and parallel to that section of that vein; thus ending much nearer the tip of the wing than is usually the case. The subcostal cross-vein is placed near the middle of the wing, joining the auxiliary vein to the 1st longitudinal, not very far beyond the beginning of the 2nd vein. The 2nd vein commences almost before the first third of the wing, at a moderate angle, forking just opposite the tip of the auxiliary vein, the branches practically parallel; the præfurca longer than the lower branch, which itself is rather longer than the upper one. Marginal cross-vein just beyond the fork, and a little beyond the tip of the auxiliary vein. The 3rd vein originates a little before the fork of the 2nd vein in an almost punctiform manner, meeting the anterior cross-vein at the same point. The 3rd longitudinal vein runs straight to immediately below the wing-tip. Anterior cross-vein of moderate length, meeting the discal cell before its middle, which cell is pointed at its proximal end. Upper branch of 4th longitudinal vein forked at half that portion of it lying beyond the discal cell, the veinlets nearly parallel. Lower branch of 4th vein acutely forked in the discal cell, the posterior cross-vein situated just beyond the fork. The 5th longitudinal vein bent at its union with the cross-vein; 6th vein nearly straight. The 7th longitudinal vein remarkably short, much less than half the length of the 6th vein, its tip bent sharply to the wing-margin.

Range. India.

The two Indian species may be separated easily as follows :—

Wings clear. . . . . *gracilis*, Brun.
Wings with an infuscated band across the middle. . *elegans*, Brun.

360. Paracladura gracilis, *Brun.*

Paracladura gracilis, Brunetti, Rec. Ind. Mus. vi, p. 287 (1911).

♂ ♀. *Head*: eyes separated above by a frons wider than one-third the width of the head; face above antennæ distinctly gibbous. Proboscis rather long, narrow, pale yellow, a little hairy; palpi with 1st joint pale yellow, 2nd, 3rd, and 4th black. Antennal scape pale yellow, slightly pubescent, joints very short, almost annuliform; flagellum of fifteen very elongate joints, closely but shortly pubescent, with one or two longer hairs at the

tip of each. *Thorax* considerably gibbous, uniformly pale yellow, quite bare. Scutellum, metanotum, and sides of thorax concolorous. *Abdomen* brownish yellow, with a few pale hairs at the sides; segments in the male towards the tip of the abdomen, both above and on belly, with more or less distinct blackish irregular marks. Genitalia of male rather longer than usual, especially the second joint, which is nearly as long as the first, the latter being less robust than usual, the second equally fleshy, subcylindrical, pointed, both bearing numerous soft hairs; some further appendages are visible below the claspers, also a large ventral V-shaped dark brown plate; the upper plate is also dark coloured, narrow. The female has a pair of moderately long lateral valves, blackish at the tip; below these, a pair of pale yellow, soft, hairy, short conical appendages, with apparently a pair of small claspers. *Legs* uniformly very pale yellow. *Wings*: venation in accordance with the generic description; very pale yellowish, unmarked, veins yellow; halteres yellowish, knobs a little dusky.

Length 2½ millim.

Described from a single specimen of each sex taken by me at Darjiling, 28 and 29. v. 10.

Types in the Indian Museum.

361. **Paracladura elegans**, *Brun.*

Paracladura elegans, Brunetti, Rec. Ind. Mus. vi, p. 288 (1911).

♀. *Head* rather bright yellow; frons fully one-third the width of the head; face above antennæ gibbous; on the vertex a blackish streak joining the upper angle of the eyes. Proboscis yellowish; palpi blackish, pubescent, basal half of 1st joint yellowish. Scapal joints of antennæ very short, pale yellowish, with a few hairs; flagellum blackish brown, closely and shortly pubescent. *Thorax* almost wholly brownish yellow; a trace of a dusky median stripe. Scutellum, metanotum, and sides of thorax concolorous. *Abdomen* brown, hind margin of the distinctly emarginated segments very pale yellow, with pale hairs at the sides; belly similar. Ovipositor of moderate size, resembling that of *P. gracilis*. *Legs* pale brownish yellow. *Wings*: venation in accordance with the generic description, the 7th longitudinal vein being only one-third as long as the 6th. Colour pale yellow, veins yellow, apical part of wing with slight pubescence. A narrow blackish infuscation runs from the costa, beginning just beyond the tip of the auxiliary vein and passing over the marginal vein, the fork of the 2nd, the base of the 3rd, and the anterior cross-vein; the infuscation, here shortly interrupted, is resumed on the posterior cross-vein and along the last section of the 5th longitudinal vein to the wing-margin. Halteres yellowish, clubs dusky.

Length 2–3 millim.

Described from two females taken by me at Darjiling, 26 and 29. v. 10.

Type (and second specimen) in the Indian Museum.

Whilst exhibiting all the generic characters, this species is easily distinguished from the previous one by the light but very distinct infuscation running across the middle of the wing.

Genus **CLADUROIDES**, *Brun.*

Claduroides, Brunetti, Rec. Ind. Mus. vi, p. 288 (1911).

Genotype, *Claduroides fascipennis,* Brun.; by original designation.

Two submarginal cells, five posterior cells, discal cell open.

Antennæ practically normal in the scape, which consists of the usual elongate cylindrical 1st joint and a shorter broader 2nd joint, but the flagellum shows a distinct peculiarity in possessing the unusual number of thirteen joints, oval and well separated, with minute pubescence and with verticels. Face above antennæ prominent as in *Paracladura.* Thorax equally gibbous as in that genus. In venation the present genus is also distinctly characteristic. The 1st longitudinal vein is shorter than in *Cladura*, the marginal cross-vein being at its exact tip, where it turns up into the costa somewhat abruptly. The subcostal cross-vein is at one-third the length of the wing, as in *Paracladura*, situated at a great distance from the tip of the auxiliary vein, and a considerable distance before the origin of the 2nd vein, which takes place in the middle of the wing. Discal cell open, pointed at proximal end, coalescent with 3rd posterior cell; anterior branch of 4th vein forked acutely and widely near its tip, the 2nd posterior cell being triangular, not elongate bell-shaped; posterior cross-vein situated just beyond the proximal end of the 2nd posterior cell; the posterior branch of the 4th vein similarly forked as in *Cladura*; the 7th longitudinal vein normal, as in *Cladura.*

Range. India.

Only two species are Indian, and they may be distinguished thus:—

Wings with several small infuscations........ *fascipennis,* Brun.
Wings clear except for an indistinct stigma .. *sordida,* Brun.

362. **Claduroides fascipennis**, *Brun.* (Pl. X, figs. 7, 8.)

Claduroides fascipennis, Brunetti, Rec. Ind. Mus. vi. p. 289 (1911).

♂ ♀. *Head* grey; frons one-fourth the width of the head, considerably convex. Proboscis brown, palpi blackish. Antennæ dark brown; 1st scapal joint subcylindrical, wider at tip, 2nd shorter, elongate oval, narrower at base; flagellum of thirteen

oval joints, the 1st the longest, all very distinctly separated, with close pubescence and each with a verticel of longer hairs. *Thorax* distinctly gibbous and high; the short neck placed at the lowest point of the underside (seen best in profile). Thorax, including dorsum, scutellum, metanotum and sides, mainly dark grey, the dorsum in one specimen with a moderately wide blackish brown stripe from anterior margin to suture; a blackish brown smaller mark on each shoulder connected by a very thin line on the anterior margin; two small stripes in front of the suture, with two spots behind it, irregularly shaped, of the usual nature, occupying most of the post-sutural dorsum. Scutellum somewhat produced and thickened; metanotum a little brownish. *Abdomen* dark blackish brown, emargination of segments distinct, with some pale hairs at the sides; belly similar. Genitalia of male blackish brown, a little pubescent, composed of an upper plate, a pair of claspers, with a second pair of appendages below. The female ovipositor barely thickened at the base, terminal valves reddish brown. *Legs* brownish yellow, tarsi darker; coxæ slightly dusted with brownish grey. *Wings*: venation in accordance with generic description. Pale grey; a small pale blackish brown spot on the costa, near the subcostal cross-vein; another over the base of the 2nd vein; a large oblong stigmatic spot, ending at the marginal cross-vein, proximally continued along the cross-veins narrowly but uninterruptedly to the 5th longitudinal vein, along which the colour runs to the hind margin of the wing; tips of all the veins (except the 3rd and 6th) and the bases of the forks of both branches of the 4th longitudinal, slightly infuscated. Halteres yellowish.

Length, ♂ $3\frac{1}{2}$, ♀ $5\frac{1}{2}$ millim.

Described from three males and two females in the Indian Museum with the following data: Darjiling, 9. viii. 09, type male and female taken by Mr. Paiva, and an additional male and female taken by Dr. Annandale at Phagu, 12. v. 09, and Kurseong, 7. ix. 09, respectively.

363. Cladurorides sordida, *Brun.*

Cladurorides sordida, Brunetti, Rec. Ind. Mus. vi, p. 290 (1911).

♂ ♀. *Head* dark grey, with scattered hairs. Proboscis brownish yellow; palpi dark brown. Antennæ brownish yellow; 1st scapal joint cylindrical, moderately long, 2nd shorter and broader as usual; flagellum of thirteen oval joints, diminishing in size towards the tip, the 1st being distinctly but not conspicuously larger than the rest. *Thorax* dark grey, with no obvious marks on dorsum, though the impression is given that in some specimens there may be indistinct stripes. Scutellum and metanotum similarly coloured; sides of thorax with a very slight brownish tinge. *Abdomen* dark brown. Genitalia of male consisting of a pair of rather large

brownish yellow claspers, with small narrow horny appendages towards the tips, and a narrow dorsal plate. Ovipositor of female as in preceding species. *Legs* brownish yellow, darker towards tips of tarsi. *Wings*: venation in accordance with the generic description. Pale grey, iridescent; an elongate blackish stigma is indistinctly but obviously present over the tip of the 1st longitudinal vein, ending rather sharply at the marginal cross-vein. Halteres brownish.

Length 4–5 millim.

Described from two males and one female. The type male and female, taken respectively at Simla, 10. v. 09, and Kurseong, 4. ix. 09, by Dr. Annandale; an additional male from Simla, 12. v. 09.

Type male and female (also additional male) in the Indian Museum.

Section *AMALOPINI.*

Pediciinæ, Kertész, Catal. Dipt. ii (1892).

Eyes pubescent; frons generally with a more or less prominent gibbosity, which is often much less conspicuous in dried specimens. Antennæ normally either 16-jointed, or 13-jointed; in one non-Oriental genus (*Ula*) the unusual number of 17 joints is found. Wings with two submarginal cells, and four or five posterior cells; discal cell open or closed. Subcostal cross-vein ending at a considerable distance anterior to the tip of the auxiliary vein and also before the origin of the 2nd longitudinal vein.* Penultimate posterior cell nearly always pointed at the base (except in *Ula*). Tibiæ with spurs at the tip, often minute.†

This section of the TIPULIDÆ BREVIPALPI forms a small compact group distinguished by the pubescent eyes and the frontal gibbosity.

Osten Sacken suggested the division of this section into two natural groups, but apart from the character of the difference in number of the antennal joints, the dividing line between them is

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* Except in *Trichocera*, which is here removed to this Section from the LIMNOPHILINI, its affinities to that Section being, to my thinking, much less than to the AMALOPINI. In this genus the subcostal cross-vein occurs a little way beyond the origin of the 2nd longitudinal vein, but before the middle of the wing.

† Personally I have often been unable to discern any spurs at all, and it seems to me that they are more often completely absent than Osten Sacken (who placed considerable reliance on this character as one of the primary means of classification) suspected. At any rate, when they are so microscopic that an ordinary observer with an ordinary microscope fails to perceive them, they are very unsafe characters on which to separate sections or subfamilies.

rather frail and subject to slight modifications which would render it almost valueless.

The characters of the first group were :—antennæ of 16 joints ; the 2nd submarginal cell never longer than, but generally a very little shorter than the 1st posterior cell ; the præfurca rather elongate; the palpi rather more elongate than in the next group. This group contained only *Amalopis*, Hal., and *Pedicia*, Latr. This second genus is not Oriental, but it contains a widespread European species, *P. rivosa*, L., which may easily extend to Western or Northern India.

The second group was characterised by a 13-jointed antenna; the 2nd submarginal cell never being shorter than the 1st posterior cell, but generally a little longer, and the præfurca very short; the palpi rather shorter than in the first group.

Table of Genera.

1. Antennæ filamentous, 16-jointed, joints almost inseparable at tip; 7th longitudinal vein much shortened, incurved strongly at tip	TRICHOCERA, Mg., p. 508.
Antennæ normally nematocerous, the exact number of joints being easily counted; 7th longitudinal vein neither shortened nor incurved at tip	2.
2. Anterior cross-vein connecting the 2nd longitudinal vein (either its præfurca or the lower branch) *not* with the 3rd vein as usual, but with the 4th longitudinal.* Antennæ of sixteen joints .	AMALOPIS, Hal., p. 513.
Anterior cross vein connecting 3rd and 4th longitudinal veins as usual	3.
3. Antennæ 16-jointed	AMALOPINA, gen. nov., [p. 517.
Antennæ 13-jointed †	RHAPHIDOLABIS, Os. Sac., [p. 517.

Genus TRICHOCERA, *Mg.*

Trichocera, Meigen, Illig. Mag. ii, p. 262 (1803).
? *Petaurista*, Meigen (1800), *sine sp.*

GENOTYPE, *Tipula hiemalis*, De Geer (*teste* Coquillett, 1910).

Head: eyes large, convex, pubescent, separated above by a broad or very broad frons, contiguous or subcontiguous on underside, flattened; two distinct ocelli on each side of a gibbosity just above the antennæ. Proboscis short; palpi elongate, especially the last joint, which is narrowed at its middle, sometimes appearing as two joints. Antennæ 16-jointed, longer than the

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* In other words, the 3rd longitudinal vein emerges from the 2nd *beyond* the anterior cross-vein, instead of before it as usual.

† In the two new species referred here to this genus there are fifteen very distinct joints.

head and thorax together, very slender; scapal joints very short; the flagellum of cylindrical joints, fourteen in number, becoming very attenuated towards the tip, the joints being almost indistinguishable.* *Thorax* moderately oval and convex, suture distinct, post-sutural longitudinal depression very wide and shallow. *Abdomen* normal, linear. Genital organs of male consisting of a basal subcylindrical joint and a second movable elongate fleshy cylindrical joint. Ovipositor of female peculiar, owing to the convex side of the arcuated valves being uppermost, the concave side being below.† *Legs* slender, practically bare; tibiæ with spurs at the tips, empodia distinct. *Wings* moderate in size, comparatively broad. Two submarginal cells and five posterior cells; discal cell present, generally pointed at the proximal end; subcostal cross-vein before the middle of the wing, but a little way after the origin of the 2nd longitudinal vein; the marginal cross-vein just after the fork of the 2nd vein, of which the præfurca forms about half its entire length; emergence of 3rd vein from the 2nd sometimes rectangular, sometimes almost punctiform. Anterior branch of 4th longitudinal vein forked, posterior cross-vein situated near the end of the discal cell. The 7th vein very short, curved suddenly into the margin of the wing at its tip; 1st posterior cell with nearly parallel sides, 4th posterior cell sometimes pointed at the proximal end, normally rectangular.

Range. Europe, Asia Minor, the Orient, North America, Auckland Is.

After considerable deliberation I venture to remove this genus from the LIMNOPHILINI to the AMALOPINI, to which section I am convinced it is much more closely allied: (1) by the pubescent eyes, a peculiar character of the AMALOPINI only; (2) by the conspicuous frontal gibbosity, also almost peculiar to this section; (3) by the position of the subcostal cross-vein, which in this section is normally before the origin of the 2nd longitudinal vein, whereas, although in the present genus it is situated a little beyond the origin of the 2nd vein, it is still nearer its technical position than it would be in LIMNOPHILINI, where it is always situated at or near the tip of the long auxiliary vein. Finally, the general appearance of *Trichocera* appears to me more akin to *Amalopis* than to any other genus; the broader wings, the often pointed shape of the bases of both the discal cell and the penultimate posterior cell in some of the species, being also points in common.

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* Most authors have either quoted the number of joints of the antennæ incorrectly, or left the number doubtful.

† Osten Sacken says of this organ: "The ovipositor of the female is distinguished from all the ovipositors of the TIPULIDÆ by being reversed," and observes that it is strange that no previous author had noticed that fact. Moreover, the pubescence of the eyes, a very distinguishing character, considering that the eyes in most TIPULIDÆ are bare, was also overlooked by various authors for many years after its announcement by Meigen.

By placing *Trichocera* here it loses much of the abnormality attributed to it by Osten Sacken.

Life-history. The larvæ live in fungi, according to Bremi, or in rotting vegetables, according to Walker.

Table of Species.

Wings marked with pale grey spots, only a little darker than the exceedingly pale grey ground-colour.	
The darker grey spots arranged more or less in ocellar form	*ocellata*, Wlk., p. 510.
The darker grey spots not arranged in ocellar form	*punctipennis*, sp. n., p. 511.
Wings absolutely clear of markings of any kind.	
The 4th posterior cell pointed at its basal end	*flava*, sp. n., p. 512.
The 4th posterior cell rectangular at its basal end	*montana*, sp. n., p. 513.

364. Trichocera ocellata, *Walk.*

Trichocera ocellata, Walker, Ins. Saund., Dipt. pt. v, p. 433 (1856).

♀. *Head* dark grey; the closely pubescent eyes separated by a broad dark grey frons of about one-third the width of the head, with some pale hairs. Proboscis brown; palpi dark brown. Antennæ moderately dark brown, with close pale pubescence. *Thorax* cinereous grey, darker grey on dorsum, with a pair of very narrowly separated median dark brown lines attaining the anterior margin. *Abdomen* brown, with short pale yellow pubescence, the segments well emarginated; the ovipositor brownish yellow, normal. *Legs* brownish yellow, femora brownish towards tips but extreme tips pale; tips of tarsi darker. *Wings* very pale grey; venation normal. Very numerous small pale grey elongate spots placed irregularly but mostly perpendicularly between the veins; rather large pale grey spots over the origin of the 2nd vein over the marginal cross-vein, including the fork of the 2nd vein on the origin of the 3rd vein, including the anterior cross-vein; and one spot spreading over the two submarginal cells towards their tips; the spots in the axillary cell along the hind margin of the wing are also much larger. Halteres long, pale yellow; clubs black.

Length 5 millim.

Redescribed from a single female from Theog, Simla Hills, 2. v. 07 (*Annandale*), in the Indian Museum.

Type in the British Museum, in indifferent condition, although the wing-markings are sufficiently well preserved for comparison to be possible.

This is probably the *Trichocera ocellata* of Walker, although he

speaks of the grey spots in the wings forming parts of circles, presumably after the fashion of the markings in the Tabanid genus *Hæmatopota*. The rest of his short description would apply very well. The present description is based on the individual specimen herein referred to, no part of Walker's description being incorporated; so that in the event of my identification being incorrect, all that will be required will be to provide a new name for the species described here.

365. **Trichocera punctipennis**, sp. nov. (Pl. X, fig. 13.)

♂ ♀. *Head*: vertex, frons, back of head and proboscis dark grey or cinereous grey; frons from one-half to one-third the width of the head; eyes contiguous below, flattened. Palpi dark brown, considerably elongated. Antennal scape reddish brown or brownish yellow, flagellum brownish yellow or dirty black, very attenuated towards tip. *Thorax* cinereous grey or dark grey, dorsum darker grey, normally with a median pair of narrow well-defined and rather widely separated dark brown lines attaining the anterior margin; a shorter dark brown narrow stripe on each side; a small dark grey spot near the tips of the median stripes, on the outer side. In some specimens no distinct dorsal stripes are visible, in some the dorsum is rather darker grey, the colour carried forward as a wide median stripe to the anterior margin; in these cases the dorsum behind the suture is darker grey, the median post-sutural depression and dorsum of scutellum greyish, the edges of the scutellum pale, the metanotum darker. Sides of thorax more or less yellowish grey. *Abdomen* dark brown, with rather numerous pale hairs, posterior margins of segments more or less broadly yellowish; belly similar. Genital organs of male brown, elongate, with a pair of slender yellowish flexible appendages. In the female the ovipositor is small, normal. *Legs* brownish yellow, with a pale blackish subapical ring on the femora; tips of tarsi darker. *Wings* very pale grey, with pale grey or brownish grey spots. Auxiliary vein ending at or just before three-fourths of the length of the wing, exactly opposite the marginal cross-vein; the 1st longitudinal vein ending a short distance beyond, half-way between the marginal cross-vein and the tip of the anterior branch of the 2nd vein; the 2nd vein begins at a little before the middle of the wing, nearly at a right angle, the præfurca being rather more than half the whole length of the wing, the fork occurring just before the marginal cross-vein, the branches parallel; the 3rd vein begins beyond the middle of the præfurca, at a right angle, running parallel with the 2nd vein: anterior cross-vein nearly in a line with the basal section of the third vein, and of about the same length; discal cell actually pentagonal, but approximately triangular; upper branch of 4th longitudinal vein forked before the middle (after

quitting the discal cell), the veinlets nearly parallel, slightly diverging towards the tips; a veinlet issues from the middle of the outer side of the discal cell nearly parallel with the lower branch of the 4th vein, all the vein endings of which are approximately equidistant; posterior cross-vein placed towards the end of the discal cell; 5th vein rather sharply bent, 7th vein greatly curved, very short. The wing-markings are slightly brownish grey or pale grey; all the cross-veins narrowly suffused, and pale grey spots are distributed as follows:—at the tip of the marginal cell; a distinctly oblong spot in both submarginal cells, beyond the middle; a smaller spot in the middle of all the posterior cells, from the 1st (in which it is usually oblong) to the 5th, but in some specimens one or more of these spots may be wanting; a spot over the origin of the 2nd vein, another over its fork, and two in the anal cell (one basal, one median); the spots, especially the smaller ones, are sometimes reduced in size, sometimes absent. Halteres yellow, stem long, clubs black.

Length 4–5 millim.

Described from several examples of both sexes taken by Dr. Annandale at Simla, 23–25. iv. 07, where he found it tolerably common.

Types in the Indian Museum.

366. **Trichocera flava**, sp. nov.

♀. *Head* wholly pale yellow, except flagellum of antennæ which is pale brown; the joints very elongated and indistinctly separated towards the tip, where they are by no means lessened in length. Eyes shortly and densely pubescent; vertex and the broad frons very convex, produced forward, forming a large cavity below, from which protrude the antennæ. *Thorax* pale yellow, with a narrow distinct but not well-defined blackish stripe. Front of mesothorax rather elevated and foreshortened, whilst the anterior corners or shoulders are depressed and somewhat enlarged. *Abdomen* uniformly pale brownish yellow, with pale yellow pubescence; belly similar. Ovipositor pale yellow, short, partly withdrawn. *Legs* wholly pale yellow, tips of tarsi barely darker. *Wings* uniformly very pale but distinctly yellow, wholly unmarked, veins yellow. Venation normal; the 1st longitudinal vein very long, reaching nearly to the tip of the upper branch of the 2nd vein; all the veins with bristles of moderate length, but not very thickly placed; the 4th posterior cell pointed at its inner end, with the posterior cross-vein just after the base of the cell.

Length 3 millim.

Described from a single female taken by me at Darjiling, 28. v. 10.

Type in the Indian Museum.

367. **Trichocera montana**, sp. nov.

♂. *Head* brownish yellow; vertex and the broad frons very convex, as in *T. flava*; eyes shortly and densely pubescent. Proboscis and palpi brownish, antennæ brownish yellow. *Thorax* brownish yellow, the dorsum brown. *Abdomen* brownish yellow, with a little pale pubescence, the tip darker. Genitalia large, brownish, hairy, the only easily visible parts being the large basal joint of the claspers, and the oval, brownish yellow, moderate-sized second joint.* *Legs* brownish yellow, tarsi darker. *Wings* clear. Venation nearly as in *T. flava*; veins yellow, 1st longitudinal vein not so long proportionately as in *flava*; branches of the 2nd vein rather wider apart; the 4th posterior cell rectangular at the base, with which the posterior cross-vein is in an exact line. All the veins minutely spinose, as in *flava*, but the bristles are shorter and more perpendicular. Halteres brownish yellow.

Length 3 millim.

Described from a single male from Badrinath, 10,200 ft., Garhwal district, 27. v. 10 (*A. D. Imms*).

Type in the Indian Museum.

Genus **AMALOPIS**, *Hal.*

Tricyphona, Zetterstedt, Ins. Lapp., Dipt. p. 851 (1838).
Amalopis, Haliday, in Walker's Ins. Brit., Dipt. iii, p. xv (1856).
Bophrosia, Rondani, Dipt. Ital. Prod. i, p. 183 (1856).
Crunobia, Kolenati, Wien. Ent. Monats. iv, p. 391 (1860).
? *Nasiterna*, Wallengren, Entom. Tidskr. ii, p. 179 (1881).

Genotype, *Limnobia occulta*, Mg. (*teste* Coquillett, 1910).

Head: frons moderately wide, with a small but perceptible gibbosity above the antennæ; the eyes pubescent, narrowly separated below. Proboscis short, with large hairy labella; palpi comparatively long, 4th joint longer than the 3rd but generally shorter than the 2nd and 3rd together. Antennæ 16-jointed, short, a little longer than the head; scape normal; the flagellum, which is sometimes incrassated at base, has the joints often almost coalescent, tapering and slender towards the tip; in some species the joints are well separated, without any incrassation at base; the upperside of the antennæ with longer verticillate hairs, the lower side with close short pubescence. *Thorax* normal, neck moderate, suture distinct. *Abdomen* rather long, sometimes narrow at base, and more or less club-shaped towards the tip. Male genitalia with the first stout conical joint of the claspers of a coriaceous nature, the second joint bearing a bifid horny

* The tip of the abdomen is bent over the back, and the genitalia twisted round, so that it is very difficult to make out the structure.

appendage, also a blunt fleshy lobe of moderate size; a pair of interior small horny appendages are present. The ovipositor of the female normal, moderately long, rather broad, consisting of a nearly straight pair of valves. *Legs* moderately stout; tibiæ with spurs, which are sometimes not very distinct; empodia distinct, ungues smooth. *Wings* moderately broad, tips rounded, in some species slightly broader in the female; with two submarginal cells, five posterior cells, and the discal cell open or closed; tip of auxiliary vein at a long distance beyond the beginning of the 2nd longitudinal vein, and distinctly beyond the middle of the wing; subcostal cross-vein before the beginning of the 2nd vein, which originates at or immediately before the middle of the wing; the 1st longitudinal vein ends about or before half-way between the tip of the auxiliary and the tip of the wing, the marginal cross-vein being at or very near this tip; * the præfurca originates either at an angle or in a gentle curve, and is as nearly as long as, or in some species, distinctly shorter than, the upper branch of the 2nd vein, the lower branch of which is parallel to the 3rd vein. "The relations between the two branches of the 2nd vein, the 3rd vein, and the anterior cross-vein, are very peculiar in this genus, and deserve particular attention. The small cross-vein (=anterior cross-vein) always connects the 4th longitudinal vein with the 2nd vein or the posterior branch of that vein; never with the 3rd vein, as is almost universally the case among the Diptera; in other words, the 3rd vein in the genus *Amalopis* (at least, in all the instances observed by me) always issues from the 2nd, *beyond* the small cross-vein" (*Osten Sacken*).† The 1st submarginal cell is in some species longer, and in others shorter, than the 2nd. The discal cell is present or absent; when present it is either four-sided, kite-shaped, pointed or nearly so at the base, or else it is pentagonal; but sometimes it is six-sided, generally elongate; the anterior cross-vein in a line with its upper basal corner; the posterior cross-vein placed at or just beyond its base. When the discal cell is closed, the 2nd posterior cell is usually petiolate, that is to say, the anterior branch of the 4th longitudinal vein in such cases is forked, generally near its tip. In some species ‡ the 4th posterior cell has its base in a line with the proximal side of the discal cell. The 5th, 6th, 7th veins straight, or nearly so, the 5th slightly curved at the junction with the posterior cross-vein.

Range. Europe, North America and Australia, to which is now added India.

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* In *Amalopis inconstans*, Os. Sac., a North American species, it is placed before the middle of the anterior branch of the 2nd vein.

† The position of the anterior cross-vein referred to above, is the same as in *Ptychoptera* and *Bittacomorpha*, in the subfamily Ptychopterinæ.

‡ *A. occulta*, Mg., *gmundensis*, Egg., *opaca*, Egg., from Europe, and at least one North American species, *A. vernalis*, Os. Sac.

This genus is allied to *Pedicia*, Latr., *Dicranota*, Zett., *Rhaphidolabis*, Os. Sac., *Plectromyia*, Os. Sac., and *Ula*, Hal.

A correspondence carried on between Osten Sacken (Berl. Ent. Zeits. xxxi and xlii) and Bergroth (Wien. Ent. Zeit. vii and xvii) as to the question of priority and suitability between *Amalopis*, Hal., and *Tricyphona*, Zett., resulted in the former name being permanently retained.* Osten Sacken pointed out that "the almost absolute rules of priority recognised for specific names are not equally applicable to the generic ones. Zetterstedt's definition of *Tricyphona* is not applicable to *Amalopis*, as it is principally based upon the absence of the discal cell, a character of mere casual importance." Haliday, in 1856 (in Walker's Insecta Britannica, Diptera, vol. iii), noted the pubescent eyes, the frontal tubercle and the absence of the discal cell, to which Osten Sacken added (Proc. Acad. Nat. Sci. Philad. 1859) the position of the subcostal cross-vein, and upon these characters founded his group AMALOPINA.

Variation in the venation in this genus appears to be common; the discal cell being very inconstant in the same species, whilst in some European and North American species † the second basal cell is divided by a supernumerary cross-vein.

Table of Species.

Wing wholly clear; discal cell closed	*glabripennis*, sp. n.
Wing with cross-veins and tips of longitudinal veins a little infuscated	*elegans*, sp. n.

368. **Amalopis glabripennis**, sp. nov. (Pl. X, fig. 12.)

♂. *Head*: eyes contiguous below; frons very broad, moderately dark grey, as are also the neck and the back of the head. Antennæ dark brown, rather pubescent; palpi dark brown. *Thorax* grey, with three dorsal stripes; the median one broad, attaining the anterior margin; the outer ones short, pointed in front, and (except for the narrow pale suture) joined to the single postsutural oval spot on each side; sides of thorax yellowish, with some grey on the underside. Scutellum and metanotum yellowish grey; the former a little brownish on dorsum. *Abdomen* dark brown, blackish towards tip, with pale pubescence at the sides; belly yellowish on basal two-thirds. Genitalia blackish, consisting mainly of a pair of rather large black pointed claspers, with dark brown hairs, also a small

* See also Osten Sacken's notes (Berl. Ent. Zeits. xxxi, p. 224) on the synonymy of this genus, with special reference to *Tricyphona*, Zett., *Bophrosia*, Rond., and *Nasiterna*, Wallg.

† *A. varinervis*, Zett., and *A. hyperborea*, Os. Sac., respectively.

blackish ventral plate. *Legs*: coxæ pale yellow, fore pair black, slightly thickened towards tip; posterior femora brownish yellow; tibiæ and tarsi brownish yellow with blackish tips. *Wings* clear, very iridescent; venation normal, discal cell closed, veins yellow; stigma represented by only a very slight brownish yellow darkening. Halteres rather long-stemmed, yellowish and distinctly pubescent throughout.

Length 5–5½ millim.

Described from two males taken by me, 1. x. 08, at Darjiling.

Type in the Indian Museum.

369. **Amalopis elegans**, sp. nov. (Pl. X, fig. 11.)

♂ ♀. *Head*: antennæ and palpi yellowish, with barely a tinge of brown; occiput with a few short golden hairs; eyes widely separated. *Thorax* pale yellowish, with white dusting; three dorsal pale brown stripes, the median one double, not quite attaining the anterior margin and terminating indistinctly before the suture; outer ones shorter; mesonotum behind suture slightly tinged with brownish; sides of thorax dirty yellowish, pleuræ a little dark. Scutellum pale whitish yellow; metanotum rather elongate, a little darkened. In the female the thoracic stripes are less distinct. *Abdomen* of male darker, of female lighter, brown, in both sexes with distinct yellow pubescence at the sides; belly concolorous. Genitalia of both sexes brownish yellow, moderate in size, apparently normal. *Legs* very pale yellow, extreme tips of all the joints a little blackish; femora with a little pubescence on the underside. *Wings* very pale grey. Venation normal, but the posterior cross-vein placed at the basal corner of the discal cell, the latter being four-sided and kite-shaped; all the veins, except on the basal half of the wing, very narrowly infuscated, just sufficient to be distinctly perceptible; at the præfurca, the cross-veins, tip of the auxiliary and of the upper branch of the 2nd longitudinal vein, the darkening is slightly more noticeable; stigma, limited by the tip of the auxiliary vein and the marginal vein, pale brownish yellow, the tip of the marginal cell being slightly more hyaline than the rest of the wing. Halteres blackish.

Length 3½–4 millim.

Described from two males and a female all taken at Kurseong by Dr. Annandale, the *type* male on 28. vi. 10, the *type* female 20. vi. 10, the other male 18. vi.10.

Types in the Indian Museum.

Genus **AMALOPINA**, gen. nov.

This genus agrees with *Amalopis* except for the position of the anterior cross-vein, which unites the 2nd and 3rd longitudinal veins, as usual in Diptera, and not the 2nd and 4th as in *Amalopis*. This is the chief generic difference. Other characters, which may or may not be constant in subsequently discovered species, are the open discal cell coalescent with the 3rd posterior cell, and the presence of a supernumerary cross-vein across the middle of the 2nd submarginal cell. There is only one species.

370. **Amalopina elegantula**, sp. nov.

♂. *Head*: antennæ yellowish; palpi rather large, dark brown. (Remainder of head discoloured by some liquid, but apparently it is yellowish.) *Thorax* pale yellowish; a single brown, moderately wide, distinct median stripe from anterior margin to suture, where it vanishes; and an outer stripe on each side commencing behind the suture, and continued posteriorly to the metanotum; sides of thorax pale yellowish. *Abdomen* brownish, posterior margins of segments darker; belly similar. Genitalia brownish yellow, moderate in size, slightly pubescent, two-jointed, terminating in hooks. *Legs* very pale yellow, tarsi whitish; middle femora dark brown (fore legs missing). *Wings* nearly clear. The 2nd longitudinal vein forking soon after the origin of the 3rd vein; the 2nd submarginal cell with a supernumerary cross-vein (situated in one wing of the type specimen distinctly before the middle, and in the other wing exactly at the middle) in a line with the marginal cross-vein; discal cell open, coalescent with 3rd posterior cell, 2nd posterior cell petiolate; posterior cross-vein just beyond base of discal cell; the base of the discal cell made up of two short veins forming the bases of the actual forking of the 4th longitudinal vein. Halteres pale yellowish white.

Length 2½ millim.

Described from a single male taken by me at Darjiling, 26. v. 10.

Type in the Indian Museum.

I would not have described so imperfect a specimen but that its characters seem to render the species easy of recognition.

Genus **RHAPHIDOLABIS**, *Os. Sac.*

Rhaphidolabis, Osten Sacken, Proc. Ent. Soc. Philad. 1865, p. 225; Monog. Dipt. N. Am. iv, p. 284 (1869).

GENOTYPE, *Rhaphidolabis tenuipes*, Os. Sac., by original designation.

Head: eyes distinctly pubescent, approximate on underside of head; frons rather broad; a small bump over the antennæ, which becomes much reduced in size in dried specimens. Proboscis

short palpi short, 1st joint somewhat attenuated, the other three joints stouter. Antennæ with the unusual number of thirteen joints;* if bent backwards they would barely reach the dorsum of the thorax; the joints of the flagellum oblong; antennæ of the male with dense delicate pubescence, the alternate joints with short verticels. *Thorax* with the anterior part produced into a short neck, moderately broad; the dorsum moderately arched, the suture distinct. *Abdomen* elongate. Genitalia of male club-shaped, consisting of the usual large basal pair of claspers surmounted by horny terminal appendages; one pair of these appendages is elongate needle-shaped,† conspicuous in, at least, living specimens, apparently shrivelling up in dried ones. The female ovipositor has the upper valves rather long, broad, arcuated and blunt; the lower ones being shorter and moderately broad. *Legs* long and slender: tibiæ with minute spurs;‡ empodia distinct, ungues very minute. *Wings* rather elongate or moderately broad; two submarginal cells and five posterior cells; the discal cell closed or open. The auxiliary vein ending at about three-fourths the length of the wing, the 1st longitudinal vein a little beyond; the subcostal cross-vein at about one-third of the wing; the 2nd longitudinal vein begins in a curve, about the middle of the wing, the præfurca from one-third to one-half the length of the vein, the branches approximately parallel; the 3rd vein issuing either from towards the end of the præfurca or from the beginning of the lower branch; the anterior cross-vein nearly or quite in a line with the basal section of it, joining the 4th vein at or very near its forking; upper branch of 4th vein practically in a straight line with the basal section, forked near its tip; the lower branch forked before its middle, the proximal end of the 3rd posterior cell pointed; the posterior cross-vein just beyond the fork of the 4th vein; the 5th, 6th, and 7th longitudinal veins nearly straight.

Range. The only three species previously known are from North America.

Only two Indian species are referable to *Rhaphidolabis*, and there seems no reasonable doubt that they belong to this genus as the venation and other characters agree, though each has distinctly 15-jointed antennæ, whereas Osten Sacken specifies 13 as the normal number. The generic diagnosis may advisably be altered to embrace 15-jointed species.

The two species may be distinguished as follows:—

Wings wholly unmarked	*indica*, sp. n.
Wings with several small blackish infuscations .	*fascipennis*, sp. n.

* This is on the authority of Osten Sacken, referring to *R. tenuipes*, Os. Sac., of which he examined a living specimen.

† From which the generic name is derived, meaning "needle-forceps."

‡ These may easily be overlooked, according to Osten Sacken; personally I have not been able to detect any.

371. **Rhapidolabis indica**, sp. nov. (Pl. X, fig. 15.)

♂ ♀. *Head*: vertex and the rather long neck cinereous to ash-grey; underside of head yellowish; eyes shortly and sparsely pubescent. Proboscis yellowish, palpi brownish grey. Antennæ 15-jointed, light brown or brownish yellow, shortly verticillate and minutely pubescent; 1st scapal joint elongate, cylindrical, 2nd cup-shaped; 1st flagellar joint elongate, the remaining joints oval, tapering. *Thorax* light grey or cinereous grey; shoulders yellowish; a dorsal blackish stripe, broadening in front, with traces of a median dividing pale line, the stripe reaching the suture only; on each side the usual shorter stripe; these stripes hardly visible in at least one specimen. Scutellum light grey, scutellar ridge a rather prominent yellowish ligament on each side uniting it to the thorax; metanotum d. rk grey; sides of thorax darker grey. *Abdomen* dark blackish grey or yellowish grey, the hind margins of the segments well marked, yellowish; belly similar; sparse greyish hair on both surfaces of the abdomen. Genitalia yellowish, elongated. *Legs* brownish yellow, minutely pubescent, femora a little darker; tibiæ with no trace of spurs at the tip; tips of tarsi black. *Wings* very pale grey, unmarked. Venation normal, stigma rather faint. Halteres grey.

Length $3\frac{1}{2}$–$4\frac{1}{2}$ millim.

Described from a male and female from the Simla hills, the male taken at Theog, 8000 feet, 27. iv. 07, the female at Matiana, 8000 feet, 28–30. iv. 07, both captured by Dr. Annandale.

Types in the Indian Museum.

Rhaphidolabis, as created by Osten Sacken, should have only thirteen joints to the antennæ, whereas both these specimens have fifteen very distinct and obviously separated joints. Whether subsequent species added to the genus vary from the orthodox number of antennal joints I do not know, as, so far as I am aware, only one species has been added to the two original ones established by Osten Sacken, all three species being North American. However, the pubescent eyes and the exact agreement in venation, in addition to an agreement in all other generic characters, tempt me to leave both species here, at least temporarily, in preference to establishing a new genus on the number of joints in the antennæ alone.

372. **Rhaphidolabis fascipennis**, sp. nov. (Pl. X, fig. 14.)

♀. *Head* light grey; eyes contiguous below. Antennæ 15-jointed, scape light grey; flagellum black, with short greyish pubescence. Proboscis yellowish; palpi dark brown. *Thorax* dark blackish grey, with a well-defined median black stripe, and two very short outer ones, the latter pointed in front; a post-sutural, nearly oval spot on each side. Sides of thorax, scutellum

and metanotum, blackish grey. *Abdomen* uniformly dull blackish grey, with very minute grey pubescence; margins of segments very narrowly pale. Belly concolorous, with margins of segments also very narrowly pale. *Legs* dull yellowish brown, tarsi darker. *Wings* nearly clear; a pale blackish spot in middle of costa, on origin of præfurca, at tip of upper fork of 2nd longitudinal vein, and a streak along the cross-veins from the stigma to the 5th vein, which itself is slightly infuscated; a spot at the tip of the 7th vein, and the tips of most of the veins, except the 6th, slightly infuscated; stigma black, distinct, oblong, large. Halteres whitish.

Length $5\frac{1}{2}$ millim.

Described from a slightly damaged specimen in the Indian Museum collection taken by me at light, 20. ix. 08, at Darjiling.

Section *LIMNOPHILINI.*

Trichocerinæ, Kertész, Catal. Dipt. ii. p. 218 (1902).

Eyes bare, frons narrow. Proboscis short or very short, often broader than long; terminal lamellæ thick and broad. Antennæ 16-jointed, joints sometimes very elongate.

Genital organs of male represented normally (*Limnophila, sensu stricto*) by an elongated basal joint with a pair of hooks or claws at the tip, a dorsal plate of varying shape, and inner appendages; whilst in some of the other genera or subgenera two distinct joints, in addition to a thick claw-like tip, are apparent in the claspers, which vary yet again in other genera.* In the female the ovipositor is simple, the valves approximately equal.

Legs long and slender; *tibiæ with spurs*; empodia distinct, ungues smooth.

Wings with two submarginal cells, normally five (but sometimes only four), posterior cells; discal cell nearly always present, rarely absent. Marginal cross-vein present, its exact position varying, being placed sometimes just beyond the fork of the 2nd longitudinal vein, sometimes near the tip of the 1st longitudinal, or at any intermediate distance according to the species. Marginal cell varying considerably in length, as the 2nd longitudinal vein arises from considerably before, to a little after, the middle of the wing. Subcostal cross-vein generally at tip of auxiliary vein;

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* The varying characters of the groups of *Limnophila,* admitted by Osten Sacken as subgenera only, are fully enunciated by him in his 'Monograph of the North American Tipulidæ.'

upper branch of 4th longitudinal vein usually forked; 6th vein nearly straight, 7th moderately long; posterior cross-vein generally near the middle of the discal cell, never before the cell.

Table of Genera.

No cross-vein in either 2nd submarginal or 2nd basal cell	LIMNOPHILA, Macq., p. 521.
A cross-vein in one or the other of the cells mentioned.	
Supplementary cross-vein in 2nd submarginal cell	DICRANOPHRAGMA, Os. Sac., [p. 524.
Supplementary cross-vein in 2nd basal cell	EPHELIA, Sch., p. 525.

Genus **LIMNOPHILA**, *Macq.*

Limnophila, Macquart, Suit. à Buff., Dipt. i, p. 95 (1834).
Limnomya, Rondani, Dipt. Ital. Prod. iv, Corrigenda, p. ii (1861).
Pilaria, Sintensis, Sitzgsb. Naturf. Ges. Dorpat, viii, p. 398 (1888).

GENOTYPE. Coquillett ('Type species of Amer. Dipt.' 1910) sets up *Limnobia ferruginea*, Mg., as the type of the genus, but he adopts the generic name *Phylidorea*, Big., possibly because *Limnophila* is apparently preoccupied in Mollusca by Menke in 1828, although the Kertész Catalogue still retains it. Coquillett makes *Limnophila*, Macq., the same as *Pœcilostola*, Sch., of which latter *Limnobia pictipennis*, Mg., is the type; but Macquart's name has stood for too many years to be altered now.

Head: eyes bare. Proboscis short, almost transverse; palpi 4-jointed. Antennæ 16-jointed, the joints varying in length with the species; in some species filiform, much longer in the male than in the female, and also of a different structure; in some species as long as the whole body, in others of equal length in both sexes. *Thorax* normal, the neck more prominent in some species. *Abdomen* normal. Genitalia of male comparatively long, 1st joint fleshy, 2nd consisting mainly of a pair of short strong hooks in some species, and a narrow, short (quite small in relation to the 1st joint), less horny hook in others. *Wings* comparatively broad, tip moderately rounded, clear or marked. Two submarginal cells, generally five (occasionally only four) posterior cells; discal cell closed; auxiliary vein ending about opposite the base of the 2nd submarginal cell; subcostal cross-vein beyond origin of 2nd vein, near tip of auxiliary vein; marginal cross-vein technically present, more or less oblique, but in some species practically invisible; origin of 2nd longitudinal vein a little before or after the middle of the wing; the præfurca (generally beginning in a curve) varying in length from barely one-third to almost one-half the total length of the 2nd

vein; the 2nd vein forking soon after the origin of the 3rd, the submarginal cross-vein placed soon after the fork, but the relative spot at which it joins the 1st vein is variable, owing to the varying length of the 1st vein in different species; the 3rd vein always* with a short basal section; anterior cross-vein at the upper proximal corner of the discal cell which is five- or six-sided, not often more than twice as long as broad; the 2nd submarginal cell and the 1st posterior cell subequal, or the latter slightly shorter; anterior branch of the 4th vein forked or not; posterior cross-vein generally beyond the base of the discal cell, sometimes as far distant as the middle of that cell; the 5th, 6th and 7th veins comparatively straight, the latter sometimes a little sinuate, all turned down somewhat at tip.

Range. Probably world-wide, though none seem to have been recorded from Africa.

The difficulty, in fact, the impossibility of breaking up this genus into subdivisions has been fully dilated on by Osten Sacken.† The difference in length of the antennæ in the sexes of some species, as compared with their uniform length in both sexes in other species, has no systematic value, as it would separate obviously closely allied species.

The number of the posterior cells is a character of at most specific importance, open to adventitious variation; the presence of the additional cross-vein in the 2nd basal cell is accordingly to be regarded as of doubtful generic value.‡ The venation varies to some extent, often in specimens of the same species, especially in the position of the posterior cross-vein and the relative length of the petioles of the 1st submarginal cell and of the 2nd posterior cells. When the discal cell in isolated individuals is adventitiously open, the anterior branch of the 4th vein bears a double fork, similar to that of *Dolichopeza*, the posterior branch not being forked at all.

Life-history. The larval stages are passed in rotting wood, or in growing plants, according to the species, the metamorphoses of several European species having been observed. Perris describes those of *L. dispar*, Mg., § as occurring in the dry stems of *Angelica sylvestris*, through which the larvæ drive longitudinal furrows. The larva is cylindrical, shining livid grey in colour, with a horny black head; its structure closely resembles that of the typical Tipulid larvæ. *L. punctata*, Mg., is noted by Schoffer ‖ as living

* In all the species I have seen.

† Monog. Dipt. N. Amer. iv, p. 197.

‡ The recent Palæarctic Catalogue, however, admits *Idioptera*, Macq., *Dactylolabis*, Os. Sac., *Ephelia*, Sch., and *Pœcilostola*, Sch., as good genera. All the new species described herein appear to belong to *Limnophila* in a strict sense.

§ Ann. Soc. Ent. France, 1849, p. 331, pl. vii, fig. 5.

‖ Verh. zool.-bot. Ges. Wien, 1873, 1878, 1886.

in decayed beech wood; Beling's work may also be consulted on the early stages of species of this genus.

Limnophila appears to be a genus of ancient origin, as several species are recorded from Prussian amber, some of them under other generic names.

Table of Species.

Larger species, 5 millim.; sides of thorax not dusted with grey...........................	*pallidicoxa*, sp. n.
Smaller species, 3½ millim.; sides of thorax dusted with grey...............................	*simplex*, sp. n.

373. **Limnophila pallidicoxa**, sp. nov.

♀. *Head* cinereous grey, more yellowish below; back of head dark grey, with some short hairs; frons nearly one-third the width of the head, at the nearest approach of the eyes, which latter are approximated on the underside. Antennal scape with the 1st joint dark grey, 2nd black; flagellum with 1st joint yellow, rest dark brown, each joint distinctly pubescent and with a verticel of about four long hairs placed around the centre of the joint. Palpi blackish. *Thorax* cinereous grey, wholly bare; the usual three fuscous stripes, narrow, and not very well marked; post-sutural callosities chiefly fuscous on dorsum; sides of thorax pale bluish cinereous, bare. Scutellum and metanotum bare cinereous grey, with a very indistinct median darker line on both. *Abdomen* dark brown, shortly pubescent, with very narrow black edges and a thin black dorsal stripe, all more or less indistinct. Belly lighter, posterior edges of segments pale. Ovipositor shining dark brown, with long light brown shining ends. *Legs*: coxæ and trochanters yellowish, both with the tips narrowly black; femora, tibiæ and tarsi yellowish brown, minutely pubescent; tips of tarsi darker. *Wings* yellowish grey; venation normal; stigma consisting of a slight yellowish brown suffusion at tip of 1st longitudinal vein. Halteres yellowish, clubs brown.

Length 5 millim.

Described from specimens from Kurseong, 4. vii. 08 (*Annandale*), 26. iii. 10 (*Gravely*), and Bhowali, Kumaon, 14. vi. 10, at light (*Imms*).

Type in the Indian Museum.

374. **Limnophila simplex**, sp. nov.

♀. *Head*: the large flat vertex and rather narrow frons light grey; back of head darker, with some long pale hairs. Proboscis short, broad, rounded at tip, brown; palpi blackish. Antennæ brownish yellow; basal joint of flagellum apparently considerably flattened, broad. *Thorax* light greyish brown, with grey dusting

posteriorly and at the sides, and also on the scutellum and metanotum. *Abdomen* brown, with pale hairs; belly similar. Ovipositor with the basal part dark grey, the blades brownish yellow, the two pairs of valves of equal length. *Legs* uniformly yellowish brown. *Wings* clear, moderately iridescent. Venation tolerably normal; auxiliary vein ending opposite the fork of the 2nd vein, which forks rather widely at half its length, the marginal cross-vein, which is very faint, placed at the fork; the 3rd longitudinal nearly straight, its basal section very short, the anterior cross-vein moderately long; upper branch of 4th longitudinal vein forked at half its length after quitting discal cell, the veinlets diverging; discal cell twice as long as broad, the posterior cross-vein situated just before the middle. Halteres dirty yellow.

Length 3½ millim.

Described from one female from Bhowali, Kumaon, 5700 feet, 29. vi. 10 (*A. D. Imms*).

Type in the Indian Museum.

Genus **DICRANOPHRAGMA**, *Os. Sac.*

Dicranophragma, Osten Sacken, Proc. Acad. Nat. Sci. Philad. 1859, p. 240.

Genotype, *D. fuscovaria*, Os. Sac. (North America); by original designation.

This genus differs from *Limnophila* only by the presence of a cross-vein in the 2nd submarginal cell. When erected by its author it was regarded as a subgenus only, but most authors to-day give it generic rank.

375. **Dicranophragma pulchripennis**, sp. nov.

♂. *Head*: frons narrow, yellow, as is also the vertex and back of head. Antennæ shining yellowish brown, shortly pubescent; scapal joints large. Proboscis rather short, brown; palpi blackish; both moderately pubescent. *Thorax*: neck and dorsum of dark ground-colour, with close greyish yellow microscopic pubescence. Scutellum and metanotum similar. A few short hairs towards wing-bases, on post-sutural callosities and on posterior part of scutellum. *Abdomen* brownish yellow to blackish, dull, slightly hairy; a blackish line on each side of the dorsum, and the posterior margins of segments slightly pale; belly similarly marked. Genitalia of male brownish yellow; apparently consisting of a large upper and a lower hairy plate, between which is a pair of elongated claspers, ending in sharp points. *Legs* uniformly pale yellow, distinctly but shortly pubescent throughout; femora sometimes with a narrow indistinct black ring just before

the tip; coxæ shining brown, nearly bare; tibiæ with distinct, soft pubescence; tips of tarsi black. *Wings* clear, with brown marks; a stripe on the marginal cross-vein from the costa to the 5th longitudinal vein; a stripe from the costa to the 4th vein, just before the middle of the wing; a stripe, narrowing hindwards, from the costa diagonally to the inner side of the discal cell, with a small spot on the costa just in front of it, and a shorter stripe beyond the longer one, and joined to it by a narrow costal band; a Y-shaped spot on costa near tip, the stem of the latter reaching the 3rd longitudinal vein; a very small apical spot, and a small spot at tip of each vein on the posterior margin of the wing, with a larger, longer one behind the 7th longitudinal vein. The cross-veins are narrowly clouded, as are most of the veins on the posterior half of the distal part of the wing. Halteres yellowish.

Length 3 millim.

Described from a type male from Kurseong, 4–9. ix. 09 (*Annandale*), a type female from Darjiling, 8–11. viii. 09 (*Paiva*), and other specimens of both sexes from the same localities, with one from Kurseong, 27. vi. 10 (*Annandale*).

Types in the Indian Museum.

Genus **EPHELIA**, *Sch.*

Elacophila, Rondani, Dipt. Ital. Prod. i, p. 182 (1856).
Ephelia, Schiner, Wien. Ent. Monats. vii, p. 222 (1863).
? *Nasiterna*, Wallengren, Ent. Tidskr. ii, p. 179 (1881).

GENOTYPE, *Limnobia marmorata*, Mg., the first of the two species placed in his genus by Schiner; by present designation.

This genus differs from *Limnophila* only by the presence of a supernumerary cross-vein in the second basal cell; and a different structure of the male genitalia, of which the outer horny appendages are stout, blunt, and bifid at the tip. The antennæ are short in both sexes, the wings comparatively broad and spotted with darker marks. The male genitalia have the terminal (second) joint of the claspers bifid; in the female the ovipositor is long, slender, and gently curved as usual.

Range. Europe only (except for the two new species now introduced).

A genus of limited extent, built on a rather slender character, unless the male genitalia prove to be consistently different from those of *Limnophila* in all the species.

The two Indian species are immediately recognised by their difference in size:—

Length 4½ millim. .... *fascipennis*, sp. n.
Length 9 millim. .... *ornata*, sp. n.

376. **Ephelia fascipennis**, sp. nov. (Pl. X, fig. 16.)

♂. *Head*: vertex, frons, and back of head light ash-grey, with scattered yellow hairs; frons a little more than one-third of the width of the head. Antennal scape brownish yellow, 1st joint moderately long, 2nd nearly globular; flagellum pale yellow, the basal half of each joint black, the 1st flagellar joint yellow; all the joints with verticillate hairs and close yellow pubescence. *Thorax* considerably arched and elongate, produced forward into a stout conical neck. Dorsum brownish grey, with some indistinct darker marks and spots; sides brownish yellow. *Abdomen* brownish yellow; sides with a blackish stripe, and posterior margins of segments more or less black. Genitalia consisting of a bi-jointed pair of claspers, protected by a dorsal concolorous plate, the 1st joint of the claspers moderately stout, the 2nd joint narrower. *Legs*: coxæ brownish yellow, with black marks; femora yellowish, with a broad light brown apical ring; tibiæ and tarsi yellowish, tips of tarsi a little darker; all the legs distinctly and shortly hairy. *Wings* nearly clear, with some bright brown marks on the costa and a number of pale grey spots scattered over the rest of the surface. Auxiliary vein ending some distance beyond the middle of the wing, the 1st longitudinal vein ending some distance beyond that, the subcostal placed at very nearly the tip of the auxiliary vein; the 1st longitudinal vein very uneven in its course towards its tip; the 2nd vein begins at a right angle distinctly before the middle of the wing, forking just at its middle, the branches diverging, the upper one much shorter; the 3rd vein begins a little before the fork of the 2nd, at a right angle, the basal section being about as long as the anterior cross-vein, which is almost in a line with it; all the veins in this part of the wing practically parallel, except that the 1st posterior cell is narrower at its tip, through the forking (at half its length) of the upper branch of the 4th vein; discal cell much wider at the tip than at the base, the basal side rather short, joining the anterior cross-vein; veinlets of the upper branch of the 4th longitudinal vein practically parallel, all the vein endings of the 4th vein approximately equidistant; posterior cross-vein placed just beyond the base of the discal cell; the supplementary cross-vein in the 5th posterior cell placed at its middle, some little distance beyond the origin of the 2nd vein; the 5th and 6th veins gently curved, the 7th gently bisinuate. The wing-markings may be described as consisting principally of five brown spots on the costa; the first three squarish, the 1st nearly basal, the 3rd enclosing the base of the 2nd vein; the 4th and 5th are the two largest (the latter apical) and have a central clear space in each, very narrow in the 4th, much larger in the 5th; the first three of these brown costal spots terminate posteriorly about the 4th longitudinal vein; the

4th is pointed posteriorly, just reaching the 4th vein; the 5th spreads irregularly, gradually breaking up into small spots over the tips of the 4th vein. All the cross-veins are rather broadly and distinctly suffused with brown; the spot over the supplementary vein in the 5th posterior cell being continued broadly to the hind margin of the wing; that over the posterior cross-vein continued in a bifurcate manner to the margin of the wing; the intervening clear parts of the wing covered with very numerous quite small brownish grey or pale grey spots and streaks. Halteres yellow, clubs black.

Length 4½ millim.

Described from a single male from Kurseong, 13. viii. 09 (*Paiva*).

Type in the Indian Museum.

377. **Ephelia ornata**, sp. nov.

♀. *Head*: vertex rather bright yellowish brown in front, with pale hairs, becoming blackish grey posteriorly, with a dark median line. Scapal joints of antennæ dark brown, 1st flagellar joint pale yellowish white, the remaining joints dark brown with rather long verticillate hairs. Proboscis and palpi brownish yellow. *Thorax*: ground-colour of dorsum brownish yellow, the margin on the anterior half dark brown, the colour spreading upwards over the shoulders in the form of two stripes, with an intermediate triangular spot in the middle of the anterior margin; and also forming a rather large oval spot on each side in front of the root of the wing; in front of the suture is a transverse row of four nearly contiguous dark brown spots extending the whole width of the thorax, the median two oval, the outer two more or less circular; an indistinct brownish spot on each side behind the suture. Scutellum brownish, metanotum brownish yellow; sides of thorax dark brown, with some grey reflections here and there. *Abdomen* rather dark brownish yellow, with very short pale pubescence; a black side-stripe, on which is placed a whitish spot on the side of each segment Ovipositor large, yellowish, with yellowish hairs; the valves reddish yellow, subequal in length, the lower pair somewhat twisted round. *Legs* brownish yellow, coxæ brown, with darker marks here and there on the underside; a very faint indication of a subapical brownish ring on the femora. *Wings* pale grey. Auxiliary vein ending distinctly beyond the middle of the wing; subcostal cross-vein placed at its tip; 1st longitudinal ending a little beyond; the 2nd longitudinal vein begins at a rectangle (with a short appendix) just before the middle of the wing, forking before the tip of the 1st vein, the branches parallel nearly to their tips; the 3rd longitudinal vein originating a little before the fork of the 2nd, its basal section distinct but short, with

the anterior cross-vein in a line with it, as is also the base of the discal cell, which latter is longer than broad; the 2nd posterior cell with a petiole two-thirds as long as the cell; the 3rd and 4th posterior cells subequal, the posterior cross-vein placed a little after the base of the discal cell; the 5th and 6th longitudinal veins straight, the 7th gently sinuous. The wing-markings, which are of a dark grey or brownish grey colour, are rather difficult to describe satisfactorily.* A complete circle of narrow marks is formed near the middle of the wing, constructed as follows:—an oblong spot in the costal cell immediately above the base of the 2nd vein, two perpendicular marks in the marginal cell and 1st basal cell respectively, and a semicircular mark (with the convexity hindwards) of rather greater width in the 2nd basal cell, the inner upper end of which is joined to the costal spot first described by a narrow band across the 1st basal cell; all these marks together form approximately the circle referred to; a spot in the costal cell near the base, and one in the anal cell below it, joined on the distal side by a semicircular narrow band, thus forming about three-fourths of another circle nearer the base of the wing; below the first circle is a large, contiguous, round spot which reaches the hind margin of the wing, with two smaller spots nearer the base and also on the hind margin; a large irregularly shaped spot spreading over the fork of the 2nd longitudinal vein, the origin of the 3rd vein and the anterior cross-vein; an elongate one at the tip of the 1st posterior cell, and the tips of the veins infuscated; two narrow parallel marks in the anal cell just below the posterior cross-vein, and some similar small spots variously distributed about the remainder of the wing. Halteres blackish.

Length 9 millim.

Described from a single perfect female from Bhowali, Kumaon, 27. vi. 10 (*A. D. Imms*).

Type in the Indian Museum.

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* There being only a single specimen it is impossible to judge whether the markings as afforded by this example are constant or not.

Section *ANISOMERINI.*

The chief distinguishing characteristic of this Section lies in the antennæ which are abnormal in the number of joints, containing generally six in the male, and generally ten (not more) in the female.* In the male the antennæ are sometimes no longer than in the female; in other species, otherwise closely allied, the antennæ in the male attain a length twice that of the body, whilst in the female they are no longer than usual. This fact indicates that differences in the relative lengths of the antennæ in the sexes have only a specific, and not a generic, value. This variability is present in at least three genera, including the two principal ones, *Anisomera* (which is not Oriental) and *Eriocera*. †

Two submarginal cells are normally present, rarely one only (*Cladulipes*, a non-Oriental genus); normally there are four or five posterior cells, sometimes three only; ‡ discal cell closed or open; subcostal cross-vein near the tip of the auxiliary vein, beyond the origin of the 2nd longitudinal vein.

Tibiæ with spurs at the tip; empodia distinct; ungues generally smooth.

Genitalia of male consisting of a pair of elongated, subcylindrical basal pieces, each bearing two appendages, one of which is claw-shaped and horny, the other being coriaceous and blunt. Ovipositor in *Anisomera* rather peculiarly constructed, the valves being short and blunt, the upper ones considerably shorter than the lower ones; in the other genera the ovipositor normally constructed. §

This Section is rather closely allied to the LIMNOPHILINI, the resemblance between the venation in *Eriocera* and *Limnophila* being considerable. In the male genital organs there is also much resemblance between the two genera.

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* The exact number of joints in the female antenna is not easy to determine in dried specimens, but Osten Sacken counted ten joints on living female specimens of *Anisomera* and *Penthoptera*.

† *Eriocera* in addition to being represented by about fifty Oriental species, appears to be extensively distributed throughout the tropical regions of the globe, nearly thirty species being recorded from the equatorial regions of the New World, besides numerous others from tropical latitudes in other countries.

‡ There are three only in the two non-Oriental genera *Anisomera* and *Cladulipes*.

§ Occasional exceptions are known, as Osten Sacken speaks of a North-American species of *Eriocera* with an ovipositor constructed like that of *Anisomera*.

Genus **ERIOCERA**, *Macq.*

Caloptera, Guérin, Voy. de la Coq., Zool. Ins. pl. xx (1830).
Evanioptera, Guérin, *l. c.*, Zool. ii, p. 2 (1830).
Eriocera, Macquart, Dipt. Exot. i, 1, p. 74 (1838).
Pterocosmus, Walker, List Dipt. Brit. Mus. i, p. 78 (1848).
Oligomera, Doleschall, Natuurk. Tijds. Ned. Ind. xiv, p. 387 (1857).
Physecrania, Bigot, Ann. Soc. Ent. France, (3) vii, p. 123 (1859).
Arrhenica, Osten Sacken, Proc. Acad. Nat. Sci. Philad. p. 242 (1859).

Genotype, *Limnobia nigra*, Wied.; according to Coquillett, and apparently by Macquart's designation.

Head: eyes widely separated above by a broad frons which has often a more or less conspicuous gibbosity, which is sometimes bituberculate, the swelling placed behind the antennæ; the eyes widely separated below. Proboscis short and broad, sometimes not easily seen, the terminal labella sometimes very large and conspicuous. Palpi moderately long, sometimes as long as the head; 1st and 2nd joints elongate, 3rd shorter, 4th longest of all, the relative lengths varying in the different species. There are two types of antennæ in the male, in which sex there are only six joints, whilst in the female there are ten. In the males of some species (*E. longicornis*, Walk., of North America, for example) the antennæ are over twice the full length of the body, but in any case much longer than in the female of the same species. In the second type, the male antenna is practically no longer than that of the female. The antennæ of the elongated type vary much according to the species, not only in their actual and relative lengths as compared with the females, but also in their structure and in the nature of their pubescence. The 1st scapal joint is (in the male antennæ of the elongated type) subcylindrical, rather stout, the 2nd joint being very short, annular; the flagellum filiform, gradually attenuated towards the tip, the 1st joint being about as long as the thorax, the 2nd a little longer, the 3rd about equal to the first two taken together, the 4th being still longer than the 3rd; the flagellar joints beset on the underside, at more or less regular intervals, with strong spine-like bristles, which gradually become less bristly and more hair-like towards the tip of the antennæ; the upperside of the flagellum glabrous in some species. in others with even pubescence like that on the underside, some additional longer irregular hairs appearing towards the tip of the antennæ. The male antennæ of the shorter type would, if bent backwards, just reach the root of the wing: they are rather coarsely hairy, without verticels; the scape is of the normal form, and in the flagellum the first joint is the longest. In the female the antennæ appear to have a general resemblance to those of the male of the short type, namely a subcylindrical basal joint to the scape, followed by a shorter second joint, the 1st joint of the flagellum being the longest in the whole antenna.

In dried specimens the joints, by shrinking somewhat, are not at all easily distinguished. *Thorax*: neck very short and narrow, the head closely applied to the thorax, which is elongate, normally arched, the suture distinct. *Abdomen* of the male linear, long, occasionally very long (*E. elongatissima*, Brun.), cylindrical, in some cases almost subclavate. In the female generally widened a little beyond the middle, the tip conical. Genitalia of the male consisting of a pair of fleshy claspers, bearing two small terminal pieces, one horny and hook-like, the other obtuse, apparently softer. Some species have a pair of bifid hooks, which Osten Sacken, referring to *E. spinosa* of North America, calls a clutching apparatus. Ventral plate narrow, pointed. In the female the ovipositor takes the normal form of two elongate, pointed, rather narrow, nearly straight upper valves, and a pair of shorter lower ones. *Legs* long, comparatively stout, pubescent; the anterior pairs of femora shorter in some species;* tibiæ without spurs; empodia distinct. Some species have a small projecting tooth at the extreme base of the ungues below, not easily visible. *Wings* sometimes of normal shape and size, in some species considerably elongated, generally brownish or blackish in colour, with or without hyaline or whitish spots and marks. Two submarginal cells, generally four but sometimes five posterior cells, and a discal cell. The auxiliary vein ending about opposite the beginning of the 2nd submarginal cell, the subcostal cross-vein near the tip of the auxiliary or at a short distance before this tip. Marginal cross-vein a little before the tip of the 1st longitudinal vein; its relative position to the inner end of the 1st submarginal cell depends on the length of the latter, the anterior cross-vein being situated sometimes at the proximal end of the cell, and sometimes beyond this point; præfurca long, straight, arcuate at base only; inner end of 1st submarginal cell pointed, its petiole varying in length, sometimes shorter than the posterior cross-vein, sometimes considerably longer; anterior cross-vein placed generally beyond the base of the 2nd submarginal cell, thus making the 1st posterior cell in such species shorter than the 2nd submarginal; discal cell approximately square, normally pentagonal, but six-sided in species in which the posterior cross-vein is anterior to the end of the discal cell, in addition to the lower branch of the 4th longitudinal vein being a little bent, sufficiently to form a slight angle; the 5th vein gently angled at junction with cross-vein; the 6th and 7th veins straight.

Range. The entire tropical regions of the earth, apparently, extending to China and Japan in the case of two species, and also to North America in the case of several species.

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* Osten Sacken speaks of a North-American species in which the anterior femora were but little more than half the length of the hind ones.

Table of Species.

1.	Thorax red (deep reddish brown in *badia*)	2.
	Thorax black (brownish grey in *bicolor*, dark brown in *tenuis*)	9.
2.	Entire abdomen, or at least the ground-colour, black (bluish grey bands in *humberti*)	3.
	Abdomen mainly reddish yellow, orange or ferruginous (reddish brown in *badia*)	8.
3.	The 2nd posterior cell closed on the wing margin	*ctenophoroides*, Edw., p. 533.
	The 2nd posterior cell always open	4.
4.	Length 15–20 millim.	5.
	Length 7–10 millim.	7.
5.	Thorax unstriped	6.
	Thorax with three blackish brown stripes	*scutellata*, Edw., p. 534.
6.	No clear spot in 1st basal cell	*rufithorax*, sp. n., p. 534.
	A clear spot in this cell	*fenestrata*, Brun., p. 535.
7.	Wings pale brown, with a broad brown median cross-band	*humberti*, Os. Sac., p. 536.
	Wings subhyaline, with a median cross-band of bluish opalescent spots.	*meleagris*, Os. Sac., p. 537.
8.	Wings greyish with opalescent spots.	*pachyrrhina*, Os. Sac., p. 537.
	Wings dark brown	*badia*, Brun., p. 538.
9.	Abdomen mainly blackish or brownish, at all events the ground-colour never pale	10.
	Abdomen mainly yellowish or testaceous (half yellowish and half blackish in *bicolor* and *semilimpida*; two or three basal segments yellow in *albonotata*)	19.
10.	Abdomen without bands	11.
	Abdomen mainly black, but with pale bands (shining plumbeous in *plumbicincta* and *flavipes*)	15.
11.	First two abdominal segments orange-yellow	*rufibasis*, Brun., p. 538.
	Abdomen wholly black or blackish.	12.
12.	Length 28–30 millim.	*tenuis*, sp. n., p. 539
	Length 10–16 millim.	13.
13.	Legs mainly brownish yellow	*greenii*, Brun., p. 539.
	Legs mainly blackish	14.
14.	Legs black; antennæ wholly black.	*aterrima*, sp. n., p. 540.
	Legs bluish black; antennæ with an ochreous tinge	*fusca*, Edw., p. 541.
15.	Wings clear crystallate	*crystalloptera*, Os. Sac., p. 541.
	Wings blackish or brownish	16.
16.	Five posterior cells	*plumbicincta*, Brun., p. 541.
	Four posterior cells	17.
17.	Length 25–28 millim.	*elongatissima*, sp. n., p. 542.
	Length 20 millim.	18.

18. Wings distinctly bright yellow at the base	*nepalensis*, Westw., p. 543.
Wings not yellow at the base	*flavipes*, sp. n., p. 544.
19. Length 6–12 millim.	20.
Length 17–24 millim.	21.
20. Thorax with three black bands	*bicolor*, Macq., p. 545.
Thorax unmarked	*semilimpida*, Brun., p. 546
21. Frons with two conspicuous tubercles	*tuberculifera*, Edw., p. 547.
Frons without obvious tubercles	22.
22. Basal half of abdomen lemon-yellow.	*albonotata*, Lw., p. 547.
Abdomen brownish	*testacea*, sp. n., p. 548.

The descriptions of the species follow in the order in which they appear in the above table merely for the sake of convenience.

The genus is evidently an extensive one in the East and many more species must remain to be discovered, so that any attempt at an arrangement according to affinities would be premature.

378. Eriocera ctenophoroides, *Edw.*

Eriocera ctenophoroides, Edwards, Ann. Mag. Nat. Hist. (8) viii, p. 64 (July 1911).

"*Head* black, with a black pubescence. Antennæ 8-jointed in both sexes, but the last four joints indistinctly separated; scape dark fuscous, flagellum ochreous brown. Palpi blackish. *Thorax* entirely brick-red, velvety in appearance, except for a line round and just below the mesonotum, which is shining and translucent. Post-alar calli and protuberance below root of wing with tufts of black hairs. *Abdomen* deep black, except the 1st segment and the ovipositor which are reddish; for the most part brilliantly shining, but there are apical velvety bands on segments 2 to 6, these are broadest on segments 2 to 4, and broader in the female than in the male. Venter entirely dull. The abdomen is much broader in the middle. *Legs* uniformly dark brown, except for the red coxæ; densely covered with somewhat accumbent black pubescence; stouter and shorter than usual in *Eriocera*, giving the insect a very *Ctenophora*-like appearance, which is heightened by the form and colour of the abdomen. *Wings* dark brown, lighter towards the anal margin and in the centre of some of the cells; a small, long and narrow, more or less crescent-shaped spot in the outer marginal cell, a very small triangular spot in the 1st submarginal, and a large semicircular spot in the outer portion of the 2nd submarginal and 1st posterior, white, all reaching the wing-margin.

"There are some very interesting features in the neuration; the uppermost of the three veins proceeding from the discal cell is curved downwards, in the type male to such an extent that the 2nd posterior cell is completely closed at its apex; in the type female the small cross-vein is absent, the 1st basal cell being open. I have not met with either of these variations in any other Tipulid. Halteres brown, knob somewhat darker, stalk hairy.

"*Variety*. One female has the thorax entirely velvet-black and the legs darker.

"This species is allied to *E. selene*, Os. Sac., and *E. albonotata*, Lw. From the former it differs in its larger size and in the absence of the central lunule of the wings." (*Edwards.*)

Length 16 millim. (without ovipositor); of wing 15 millim.; of legs 27–28 millim.

Described from a type male from Kandy, 19. v. 92, a type female from Kottawa, Ceylon, 29. iv. 92, and another female from Pallamadulla, Ceylon, 17. vi. 92 (*Lt.-Col. Yerbury*).

Types in the British Museum.

379. **Eriocera scutellata**, *Edw.*

Eriocera scutellata, Edwards, Ann. Mag. Nat. Hist. (8) viii, p. 65 (July 1911).

"*Head* orange, darker brown behind the eyes, dark-haired. Front with two prominent tubercles. Scape of antennæ dark brown, flagellum ochreous, blackish towards the tips. *Thorax* ferruginous orange; mesonotum with three longitudinal black-brown stripes; the median one is narrowed behind and extends almost back to the suture, where it is seen to be double; the lateral stripes broaden out behind the suture and extend as far as the scutellum. Scutellum orange-yellow. Metanotum dark brown. *Abdomen*: in male deep orange, 1st segment brown, segments 2 to 4 with black lateral borders, segments 5 to 7 all black except for a narrow apical orange border; in female lighter orange with a black lateral line. *Legs*: femora ochreous with blackish tips; tibiæ and tarsi blackish, tibiæ more ochreous towards the base. *Wings* a uniform ochreous brown. In the female the discal cell of one wing is open. Halteres brownish." (*Edwards.*)

Length, ♂ 18 millim., ♀ 15 millim.; wing, ♂ 24 millim., ♀ 16 millim.

Described from a single male and female from Pundaluoya, Ceylon, taken September 1892 and October 1897 respectively (*E. E. Green*).

Types in the British Museum.

Mr. Edwards says:—"There is little doubt that the two specimens belong to the same species, though they differ in the colour of the abdomen and the length of the wing."

380. **Eriocera rufithorax**, sp. nov.

Head blackish grey, very shortly pubescent; frons nearly one-third width of head, narrower towards antennæ. Proboscis and the robust palpi black, shortly pubescent. Antennal scape very dark brown, 2nd joint one-fourth as long as the 1st; flagellum brownish yellow, pubescent; the whole length of the antennæ about equal to that of the thorax from the projecting mesonotum to the tip of the scutellum. *Thorax*, including scutellum and metanotum, wholly bright reddish orange. Neck very short,

dirty orange colour. *Abdomen* black, with a steely lustre when viewed from behind; posterior margins of segments with a velvet-black border. Belly dull black, bases of segments steely. Genital organs of male rather small, dark brown, shortly pubescent, an upper narrow plate, a normal pair of claspers, with some intermediate appendages. Ovipositor normal, blackish, terminal valves reddish yellow. *Legs*: coxæ bright reddish orange; remainder of the legs brownish yellow, with distinct close black pubescence; tips of femora and tibiæ narrowly black; tarsi darker. *Wings* dark brown. Auxiliary vein ending opposite the base of the 1st submarginal cell; the 2nd longitudinal vein begins much before the middle of the wing, the præfurca forming nearly half the length of the vein; the vein forking opposite the anterior cross-vein, the branches diverging rather widely; the 2nd marginal cell is thus considerably longer than the 1st, and widens considerably towards the tip; the marginal cross-vein situated beyond two-thirds of the marginal cell and beyond the forking of the 2nd vein; basal section of the 3rd vein nearly in a line with the præfurca, two and a half times as long as the anterior cross-vein; discal cell nearly rhomboidal, equal to the 2nd and 3rd posterior cells; posterior cross-vein placed nearly at the tip of the discal cell. A clear elongate spot in the marginal cell between the marginal cross-vein and the costa; a very minute clear spot in the 1st submarginal cell near the margin, and a semicircular larger clear spot on the wing-margin, spreading over the 2nd submarginal and 1st posterior cells. Halteres black.

Length 17 millim.

Described from a single male sent me by Mr. E. E. Green, taken at Kandy, October 1907, and one male and two females collected by the same gentleman, August 1906 and September 1902.

Types in the Indian Museum.

Very near *E. plecioides*, Walk.; but that author does not, in his "description" of one and a half lines, mention the steely lustre of the abdomen (which he characterises as deep black, the wings being also blackish in his species). the yellowish legs, or the clear spots in the wings. It seems therefore justifiable to conclude that the present species is not identical with his. Walker describes *E. plecioides* from Singapore.

381. Eriocera fenestrata, *Brun.* (Pl. XI, figs. 14, 15.)

Eriocera fenestrata, Brunetti, Rec. Ind. Mus. vi, p. 312 (1911).

Head: frons broad, flat, dull black with sparse hairs; ocellar triangle small; proboscis, antennæ and palpi dark brown. *Thorax*: dorsum orange-red, not shining, the colour at the sides sharply ending on a level with the wing-roots, but gradually becoming bright orange on scutellum and metanotum; pleuræ semitranslucid brown, slightly tinged with orange. *Abdomen* with the basal half of each segment sublucid leaden grey, shining, posterior half dead

black; gradually widening from the base to the 6th segment, which is the widest, thence sharply narrowing. Ovipositor somewhat robust, dark brown, practically bare, the long terminal points shining red-brown. *Legs* wholly very dark mahogany brown, nearly black. *Wings* brown on anterior half, the colour gradually fading away posteriorly to the grey hind margin; a small, roughly crescent-shaped, hyaline spot across the 1st basal cell, entering the cell above and below, and situated close to the origin of the 3rd vein. Four posterior cells; discal cell 5-sided, the veinlets from its outer upper side almost parallel; anterior cross-vein opposite fork of 2nd vein; posterior cross-vein at lower corner of discal cell; upper branch of 2nd longitudinal vein forking just before its middle. Halteres black.

Length 20 millim.

Described from a type male in the Vienna Museum from Central Tonkin and a single female (type) in the Pusa collection, taken in April 1905 in the Khasi Hills, Assam, at 1000 to 3000 feet altitude.

382. Eriocera humberti, *Os. Sac.*

Eriocera humberti, Osten Sacken, Berl. Ent. Zeits. xxxi, p. 221 (1887).

"♀. Wings brownish, with two broad hyaline bluish-opalescent cross-bands; thorax red; abdomen velvet-black with grey cross-bands. Length 9–10 mm. (without ovipositor).

"Head and 1st joint of antennæ ferruginous red; the rest of the antennæ brown. Thorax ferruginous red with a faint darker stripe in the middle; scutellum and metathorax blackish. Halteres black. Abdomen velvet-black; each segment, beginning with the 2nd, with a bluish grey plumbeous cross-band at the base; the last segment ferruginous red; ovipositor reddish brown. Legs (only the right hind leg is left) brownish red; tibiæ and tarsi darker. Wings pale brownish at the extreme base; a broad brown cross-band in the middle; it occupies, on the anterior margin, the interval between the origin of the 2nd vein and the tip of the auxiliary; on the posterior, between the tips of the 6th and 7th veins; the last quarter of the wing is pale brown. The two hyaline spaces (or cross-bands) thus remaining between the brown portions of the wing have a beautiful bluish opalescence; four posterior cells.

"*Hab.* Ceylon (Pundel Oya Valley, 3800–3900 ft. alt., 26. xi. to 27. xii. 1859, Mr. Alois Humbert, from Geneva).

"A single female in the Museum at Geneva.

"The tip of the auxiliary vein a little anterior to the proximal end of the 2nd submarginal cell; the 1st submarginal cell and the 1st posterior cell are of equal length; the great cross-vein at the very base of the discal cell." (*Osten Sacken.*)

This must be a very striking species, but I have not seen it.

383. **Eriocera meleagris**, *Os. Sac.*

Eriocera meleagris, Osten Sacken, Berl. Ent. Zeits. xxxi, p. 221 (1887).

" ♀. Thorax orange-red, with black stripes; wings subhyaline, with a cross-band formed by four opalescent spots; two similar spots near the basis. Length 7–8 mm. (without the ovipositor).

" ♂. Head reddish brown, more brown on the vertex; antennæ and palpi brown. Thorax yellowish orange; the usual dorsal stripes well defined, brownish black, with narrow orange lines between them; a black stripe on each side between the root of the wings and the humerus. Halteres black. Abdomen black, last segment orange; the colour of the abdomen is somewhat obliterated, perhaps by mould or moisture; I believe there are plumbeous cross-bands at the base of the segments. Legs (including coxæ) brown. Wings subhyaline, with a slight yellowish tinge; four bluish opalescent spots form a cross-band in the middle; the first about the middle of the inner marginal cell, the second and third at the end of the two basal cells; the fourth in the 4th posterior cell; two similar spots near the base of the wings (one in the proximal end of the 1st basal cell, the second in the proximal end of the spurious cell); four posterior cells.

" *Hab.* Ceylon (between N. Ellia and Gampola, Dec. 13 and 14, 1859, A. Humbert).

" Museum in Geneva. A single female.

" The tip of the auxiliary vein is slightly anterior to the proximal end of the 2nd submarginal cell; the 1st submarginal cell is a trifle shorter than the 1st posterior cell; the great cross-vein is a trifle before the discal cell." (*Osten Sacken.*)

No specimen has appeared before me that I could refer to this species.

384. **Eriocera pachyrrhina**, *Os. Sac.*

Eriocera pachyrrhina, Osten Sacken, Berl. Ent. Zeits. xxxi, p. 222 (1887).

" ♂ ♀. Yellowish orange; hind borders of abdominal segments black, or brownish; wings subhyaline, with a slight bluish opalescence. Length, ♂, about 6 mm.; ♀, 7–8 mm. (without ovipositor).

" Yellowish orange; antennæ, except the scapus, brown. Halteres with a brown knob; abdomen with rather narrow black or brown hind borders of the segments; the segment preceding the genitals is almost altogether black or brown. Legs brownish yellow, ends of tibiæ and the tarsi darker. Wings subhyaline, with a slight yellowish tinge and a bluish opalescence; four posterior cells.

" *Hab.* Ceylon (Kaduganawa, Oct. 8, Mr. A. Humbert); ♂ and ♀, found *in copula.*

"Museum in Geneva.

"The tip of the auxiliary vein is nearly on the same line with the proximal end of the 2nd submarginal cell; the 1st submarginal cell is a little shorter than the 1st posterior cell; the great cross-vein a little anterior to the middle of the discal cell." (*Osten Sacken.*)

I have seen no specimen of this species.

385. **Eriocera badia**, *Brun.*

Eriocera badia, Brunetti, Rec. Ind. Mus. vi, p. 310 (1911).

♀. *Head* wholly blackish grey, vertex, underside of head, and proboscis with black hairs. Antennal scape blackish grey; flagellum pale yellow, short, of eight distinct joints. Palpi a little greyish white at the emargination of the joints on the underside. *Thorax* rather deep reddish brown, with traces of four somewhat darker stripes. Scutellum and metanotum on the upper part a little lighter. Sides of thorax darker and more brownish. *Abdomen* reddish brown, a little yellowish towards the sides of some of the segments; 2nd and 3rd segments wholly yellow on dorsum, with very narrow black hind margins; base of each of the rest of the segments with a shining black band. (The abdomen has the appearance of being rather stretched longitudinally, and possibly a considerable part of these basal black bands would be invisible normally.) Ovipositor reddish brown, of moderate size. *Legs*: coxæ dark brown, pubescent; trochanters brownish yellow; femora and tibiæ yellow with blackish tips; tarsi yellowish, blackish towards the tips. *Wings* moderately dark brown; four posterior cells. A minute white spot or two near the tips of the marginal and 1st submarginal cells, and a small one lying across the tips of the 2nd submarginal and 1st posterior cells. Halteres pale brownish grey.

Length 18 millim.

Described from a single female from Peradeniya, Ceylon, taken by Dr. Uzel, 25. xii. 01.

Type in the Vienna Museum.

386. **Eriocera rufibasis**, *Brun.*

Eriocera rufibasis, Brunetti, Rec. Ind. Mus. vi, p. 310 (1911).

♀. *Head*, antennæ, proboscis, palpi, all dark blackish grey. *Thorax* wholly deep velvet-black. *Abdomen* wholly deep velvet-black, except the first two segments which are orange-yellow. Belly similar to dorsum. Ovipositor black, the valves shining brownish yellow. *Legs* dark brown, femora, tibiæ and tarsal joints blacker. *Wings* brown, darker anteriorly, clearer on hind margin; four posterior cells. Clear spots are placed as follows:— a rather large one extending over the apical part of both basal cells; two smaller round spots, one over the base of the 2nd longi-

tudinal vein, the other above the fork of the 2nd vein; one at the tip of the marginal cell; two small ones (possibly in some specimens united) in the 1st submarginal cell; a larger one extending over the 2nd submarginal cell and 1st posterior cell, all these latter spots placed on the border. All the posterior cells are somewhat clear, as is also the wing to some extent behind the 5th longitudinal vein. Halteres small, black.

Length 16 millim.

Described from a single female in the Vienna Museum from Tandong, 4000 ft., Tenasserim, May (*Fruhstorfer*).

387. **Eriocera tenuis**, sp. nov.

♂. *Head* blackish: the 1st scapal joint of the antennæ dark grey, the remainder black. *Thorax* dark mahogany-brown, with three blackish dorsal stripes of the usual pattern, and with blackish marks here and there. Pleuræ slightly dusted with grey, and traces of grey dust on the anterior margin of the thorax and elsewhere. Scutellum and metanotum reddish brown. *Abdomen*: 1st segment and base of 2nd light reddish brown; remainder of 2nd, the whole of the 3rd and 4th, and the greater part of the 5th pale yellow; remainder of abdomen blackish, the centre of the 6th segment dark brown; the 5th segment widening towards the tip, the 6th considerably wider, the remaining segments diminishing rapidly in width. *Legs*: coxæ blackish brown, dusted with grey; femora yellowish brown, rather broadly blackish at tip; tibiæ and tarsi darker brown, the latter black towards the tips. *Wings* coffee-brown: a very small white spot on the margin of the wing extending from the tip of the lower branch of the 2nd longitudinal vein to the 3rd vein. Four posterior cells. Halteres brownish black.

Length 31 millim.

Described from a single type male from the Nilgiri Hills, South India, 3500 ft., April 1910 (*H. L. Andrewes*).

Type in the Indian Museum.

388. **Eriocera greenii**, *Brun.*

Eriocera greenii, Brunetti, Rec. Ind. Mus. vi, p. 313 (1911).

♀. *Head* dark grey, with black hairs. Frons broad, but very short, of uniform width, one-third the width of the head. Proboscis dark brown, with two peculiar large, pale yellow, flattened, two-jointed labella at the tip. Palpi dark blackish brown. Antennal scape blackish, with stiff black hairs, the tip of the 1st joint with a circlet of stronger ones; 2nd joint short; flagellum brownish yellow, becoming brown at the tip, covered with irregularly placed black hairs. *Thorax*: dorsum very dark rich velvet-brown, with a few isolated short black hairs on the anterior part; two short blackish stripes towards the sides; no

trace of a median stripe. Scutellum, metanotum, and sides concolorous, all bare of pubescence; the region round the root of the wing blackish. *Abdomen* rich dark brown; extreme base of 1st segment with a slightly yellowish grey tinge; base of 2nd and 3rd segments and posterior margins narrowly of remaining segments blackish. The abdomen bare except for a few short pale hairs on the hind margins of some of the apical segments. Ovipositor conical, blackish, dull, bare, terminal blades reddish yellow. *Legs*: coxæ rich dark brown; trochanters bright, lighter reddish brown; femora and tibiæ bright brownish yellow, tips of both black, tarsi darker; all the legs with fine black pubescence. *Wings* wholly dark brown, a little darker on the costa near the base, and a little lighter in the anal and axillary cells; a small white spot near the tip of the marginal cell, and a still smaller similar one in the 1st submarginal cell; a larger (but still small) marginal white spot extending transversely over the tip of the 3rd vein. Venation as in *E. semilimpida*, except that the upper branch of the 4th vein not being forked, there are only four posterior cells. Halteres all black.

Length 16 millim.

Described from a single specimen from Kandy, 24. xi. 09 (*E. E. Green*).

Type in the Indian Museum.

This species has some general resemblance to at least three others, namely, *E. albonotata*, Lw., from which the all-brown abdomen separates it, and *E. rufithorax* and *E. fenestrata*, Brun., from which it may be distinguished by its brown thorax and yellow legs. Three specimens (of which two are in very poor condition) in the Vienna Museum, from Ceylon and Java, are probably referable to this species.

389. **Eriocera aterrima**, sp. nov.

♀. Whole body deep black, not at all shining, minutely pubescent; abdomen nearly bare.

Head: a single rather large conical protuberance on the frons immediately above base of antennæ, which latter are of similar shape to those of *E. plumbicincta*, minutely pubescent, wholly black, the tips very slightly clubbed. *Legs* wholly black, very shortly and closely pubescent. *Wings* with four posterior cells, entirely blackish; anal margin barely a little clearer. Halteres black. Ovipositor small, black.

Length 11 millim.

Described from a perfect unique specimen in the Indian Museum from Maddathorai, Travancore State, 18. xi. 08 (*Annandale*).

This must be near Edwards' *E. fusca*, described from Ceylon, but the absence of both a bluish tinge to the legs and an ochraceous tinge to the antennæ, with other minor differences, make it appear as a distinct species.

390. **Eriocera fusca**, *Edw.*

Eriocera fusca, Edwards, Ann. Mag. Nat. Hist. (8) viii, p. 66 (July 1911).

♂ ♀. "*Head*, *thorax*, and *abdomen* nearly uniform dingy fuscous. Front rather produced, but not bituberculated. *Legs* dark fuscous, with submetallic bluish reflections in some lights. *Wings* uniform fuscous. Neuration, as usual in this genus, is rather variable; in the type male there is a supernumerary cross-vein in the 2nd posterior cell, which in the right wing is bifurcated, so that the left wing has two discal cells and the right wing three. The antennæ are tinged with ochreous, and there are indications of two paler stripes on the thorax alternating with three dark ones." (*Edwards.*)

Length 10–13 millim.; of wing 8–11 millim.

Described from a type male and female, with two other males, from Pundaluoya, Ceylon, April 1889 (*E. E. Green*).

Type in the British Museum.

Mr. Edwards says:—"This species seems to be most closely allied to *E. morosa*, Os. Sac., from which it differs (judging from Osten Sacken's description) in the less intense black colour, in the bluish reflections on the legs, and in the shape of the discal cell; the 3rd posterior cell is here, as usual, longer than the 2nd."

391. **Eriocera crystalloptera**, *Os. Sac.*

Eriocera crystalloptera, Osten Sacken, Berl. Ent. Zeits. xxxi, p. 222 (1887).

"♂. Velvet-black, frontal tubercle and humeral callosities reddish; antennæ brown: abdominal segments, beginning with the 3rd, with broad shining steel-blue cross-bands, occupying nearly the whole basal half of the segments. Wings of a crystalline clearness, with black veins. Legs brown. Length about 6 millim.

"*Hab.* Rambodde, Ceylon (*Nietner*); Berlin Museum.

"A single imperfect male specimen." (*Osten Sacken.*)

I have seen no specimen of this species.

392. **Eriocera plumbicincta**, *Brun.* (Pl. XI, fig. 16.)

Eriocera plumbicincta, Brunetti, Rec. Ind. Mus. vi, p. 311 (1911).

♂. *Head*: frons and back of head deep velvet-black, with a little black pubescence; frons with a cone-like projection above each antenna; eyes black, bare. First joint of scape long, cylindrical, black; 2nd very short, globular, yellowish; flagellum yellowish, with short black hairs, of five very elongated joints of diminishing length, the last one black. Palpi black, pubescent, 2nd joint the widest, 1st and 4th the longest. *Thorax* deep velvet-black, with short black pubescence; a slight dark reddish tinge above the neck. Scutellum deep black. Dorsum of meta-

notum bright reddish orange, bare. *Abdomen* deep velvet-black; on the 2nd, 3rd, 4th, and 5th segments a broad shining lead-coloured band extending round the whole segment and covering it with the exception of a posterior marginal band of a width of one-fifth of the segment; 6th segment wholly deep black; 7th, basal half occupied by a similar leaden band, apical half black; seen from behind, there is a silver sheen on the sides of the segments. Genitalia conspicuous, bright orange-red, protected below by a blackish plate. Whole abdomen nearly bare. *Legs*: coxæ black, pubescent; femora and tibiæ orange-yellow (the latter rather darker), both with black tips; tarsi dark brown; all the legs minutely pubescent. *Wings* brown, darker in the centre; costal border to just beyond the 1st longitudinal vein distinctly orange-yellow, the colour ending at tip of the auxiliary vein; wing grey from just in front of the 6th vein to posterior margin; a good-sized white spot (approximately oval) placed obliquely across the basal cells, towards the distal ends, but quite clear of the discal cell; a smaller circular white spot just above, and a little in front of, the larger one, situated just beyond the middle of the marginal cell, and a white oval spot at apex of wing, just covering the tips of the two marginal cells. Five posterior cells. Halteres black.

Length 13 millim.

Described from one male in the Indian Museum (type) from Ukhrul, Manipur, captured by the Rev. W. Pettigrew, viii. 08; and a cotype (in the Pusa collection) taken by Mr. F. M. Howlett at Darjiling, 3–9. vi. 09.

393. **Eriocera elongatissima**, sp. nov.

♂. *Head* blackish, blackish grey behind; with sparse hairs; frons a little prominent over the antennæ; eyes black. Scape black, cylindrical; 1st joint with a few hairs, 2nd very short, bare; flagellum of five very elongate pubescent joints. Palpi dark brown. Proboscis and underside of head brown. *Thorax*: scutellum and metanotum chestnut-brown, light at the sides, and with a very slight pinkish grey reflection on the shoulders and pleuræ when viewed from certain directions; three blackish indentations, placed in triangular form, one behind the wings, one at the base of the side of the metanotum, and the third in front of the latter. *Abdomen* bright chestnut-brown, nearly ferruginous, darker towards tip; bare. The 1st segment very short; basal two-thirds of 5th and basal half of 6th almost golden yellow, the remainder of these segments blackish; a narrow black side stripe to the abdomen. Genitalia composed of a pair of dark brown claspers, bearing some short hairs, and a jointed tip. *Legs* brown; tips of femora and tibiæ black; tibiæ a little lighter brown. *Wings* uniformly rather dark brown; extreme tip whitish, extending narrowly over only the tips of the two submarginal and 1st posterior cells. Four posterior cells. Halteres dark brown.

Length 25–28 millim.

Described from two males in the Indian Museum, one from Trivandrum, Travancore State, June 1893, and the other from some part of South India, taken June 1893.

The great length of this species makes it easily recognisable.

394. **Eriocera nepalensis**, *Westw.*

Caloptera nepalensis, Westwood, Ann. Soc. Ent. France, iv, p. 681 (1835); id., Trans. Ent. Soc. Lond. 1881, p. 379.
? *Pterocosmus velutinus*, Walker, List Dipt. Brit. Mus. i, p. 79 (1848).

♂ ♀. *Head* blackish grey, with black hairs; vertex considerably prominent; back of head velvet-black, with black hairs. Antennæ and palpi blackish, shortly pubescent. *Thorax* velvet-black, with very short brown hairs; scutellum, metanotum, and sides of thorax concolorous. *Abdomen* velvet-black. In male, 1st segment short, black; 2nd, 3rd, 4th, and 5th elongate, the basal third of each occupied by a dull steel-coloured band, the middle third by a whitish or bluish grey band, sometimes more or less distinctly divided by a narrow black line into two bands; the hinder third velvet-black; remainder of abdomen velvet-black. Genitalia dull steel colour. In the female the steel bands are not obvious; the basal half or two-thirds of the 2nd segment has a whitish or bluish grey band; a similar band, generally broadly interrupted in the middle, on the basal half of the 4th segment, and an entire similar band on the base of the 5th; the rest of the abdomen velvet-black. Ovipositor bright reddish orange. The markings of both sexes are liable to a little variation, the grey and the steel bands in the male at times taking a sort of intermediate shade. One male in the Indian Museum has the abdomen almost wholly black; one of the females in the Vienna Museum has the 3rd segment with a whitish grey longitudinal streak. *Legs* wholly black; coxæ with a little very soft hair. *Wings* moderately dark brown; bright orange-yellow at the base up to a little beyond the humeral cross-vein; and with a clear transverse somewhat narrow streak from the 1st longitudinal vein, reaching barely or quite to the hind margin, where it narrows; this band being situated so that its distal margin is very close to (sometimes a little beyond) the origin of the 3rd vein, the discal cell and the posterior cross-vein. The 2nd longitudinal vein forks at about half its length; the anterior cross-vein is at or just before the middle of the discal cell, and opposite the fork of the 2nd vein; the posterior cross-vein more or less in a line with it. Halteres blackish.

Length, ♂ 18–25 millim., ♀ 15–18 millim., excl. ovipositor 3 millim.

Redescribed from a male and female *in cop.* from Nagarkot, Nepal (the male only 16 mm. long), five other males and seven other females, all in the Indian Museum; two females from Assam, in the Vienna Museum; and two females from the Khasi hills, Assam, 3000 to 5000 feet, 15. v. 05, in the Pusa collection.

The Indian Museum localities are as follows:—Kurseong, Darjiling district, 15. viii. 09 (*Paiva*), 8–9. ix. 09 (*Annandale*); Naini Tal, v. & vi. 1903; Bhim Tal, 4500 feet, 19–22. ix. 06; Dharampur, Bengal, and Simla, 5000 feet, 6–8. v. 07 (both *Annandale*); Shillong (*La Touche*); Soondrijal and Nagarkot, Nepal.*

Type in the Hope Collection at the Oxford University Museum.

There seems hardly any doubt that *E. velutina*, Walk., is an absolute synonym of this species, the description applying exactly, except that Walker speaks of a *brown* transverse mark on the already brown wings, which seems obviously an error for *clear* or *opalescent*. As a matter of fact I had already identified the Indian Museum specimens and others as *velutina* before I received the Vienna specimens, where the same species was given as *nepalensis*. Westwood's description is of course far too short for anything like accurate identification, but takes priority of Walker's.

Walker notes that the male is longer than the female. This is further corroboration of identity as the reverse is usually the case in TIPULIDÆ.

395. Eriocera flavipes, sp. nov.

♂. *Head* dark grey, with stiff black hairs on frons, vertex and back of head; frons nearly one-third the width of the head, its sides parallel. Proboscis and palpi dark grey, nearly black, considerably pubescent. The 1st scapal joint of antennæ dark brown, 2nd small, yellowish brown; flagellum yellow, last joint black. *Thorax*: dorsum soft dark grey, covered rather thickly with soft, moderately long, dark brown hairs; three median narrow black stripes from the anterior margin, converging but not uniting at the suture; an additional short stripe outside each outer stripe, beginning at its middle and ending at the suture. Thorax behind the suture, scutellum, metanotum and sides of thorax blackish grey, all with soft dark brown hairs except the metanotum. *Abdomen* dull black, with soft brown hairs; base of each segment with a dull leaden band, not noticeable at first sight, except that of the 5th segment which fills the whole dorsum and is of a bright shining lead-colour, with a narrow median black stripe that widens somewhat on the posterior border. Belly all dull black, underside of 1st segment dark brown. Genitalia dark brown, pubescent; a pair of two-jointed claspers (the 2nd joint forming a black horny hook) and a small upper piece are all the parts that are visible. *Legs*: coxæ black; femora and tibiæ and the first three tarsal joints yellow, except the tips of each, which, with the last two joints of the tarsi, are black. All the legs distinctly and rather closely pubescent. *Wings* dark brown, costal part a little yellowish, and the area posterior to the 5th longitudinal vein a little less dark; an elongate oval clear streak across the middle of the wing from the 1st longitudinal vein to

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* Assuming the identity of *E. velutina*, Walk., with *E. nepalensis*, Westw., it figures in the British Museum from Nepal, Assam, Sikkim, Khasi Hills, Kangra Valley, Darjiling, Simla, and Chin Fu San in West China.

the 6th, and just proximad of the 2nd submarginal and discal cells. Venation normal; four posterior cells; posterior cross-vein beyond the middle of the discal cell. Halteres black.

Length 12 millim.

Described from one male from Kurseong, 9. ix. 09 (*Annandale*).

Type in the Indian Museum.

A distinct and rather handsome species considerably resembling my *E. plumbicincta* owing to the silvery leaden abdominal bands, the yellow legs and the size. It is, however, at once distinguished by the dark genitalia, and more readily still by the presence of only four posterior cells.

396. Eriocera bicolor, *Macq.*

Limnophila bicolor, Macquart, Dipt. Exot. i. p. 66, pl. vii, fig. 2 (1838).

Eriocera bicolor, van der Wulp, Mid.-Sum., Dipt. p. 11, pl. i, figs. 5, 6 (1892).

"*Head* grey. Proboscis brownish; palpi blackish; 1st joint narrowed, the remainder moderately thickened. Antennæ: 1st joint rather long, brownish, the 2nd cyathiform (the remainder missing). Thorax brownish grey, with three black almost contiguous stripes; a small round black spot in front of these stripes. *Abdomen*: the first three segments yellowish orange, the rest black; ovipositor yellowish, elongate. *Legs*: femora yellowish, with ash-grey dusting (remainder missing). Halteres brown. *Wings*: the two marginal cells divided by a cross-vein; the two submarginal [cells] divided by a longitudinal vein; the outer one shorter than the inner one; the 2nd posterior cell rather small, with a long petiole; base of wing, the front margin, and a wide transverse band behind the discal cell, yellow; the remainder brown.

"From Bengal (Messrs. Diard and Duvancel), Paris Museum." (*Macquart.*)

Van der Wulp, in the Mid-Sumatra Expedition Results, notes this species, recording two females from Koetoer, Sumatra, taken in June. His specimens are 14 to 17 millim. in length, Macquart's example being only 10 millim. However, this would not preclude the two forms being identical. Van der Wulp's coloured plate of the wing shows the species to be allied in this respect to *E. nepalensis*, Westw., the brown of the wing being lighter in colour.* The venation is very similar, except that the anterior and posterior cross-veins are not so nearly in a line, and both lie distinctly before the fork of the 2nd longitudinal vein. There are, moreover, five posterior cells. The transverse stripe is twice as broad, is broader on the hind margin, and is yellow and not white. The centres of most of the cells are a little paler, a character I have not seen in *E. nepalensis*. Macquart's reference to the division of the *two* marginal and *two* submarginal cells is not clear. The subcostal

* Possibly due to the fading of the colours, which occurs in some species.

cross-vein divides the marginal cell into an inner and outer cell, the latter the longer one of the two; but even this cross-vein is absent in van der Wulp's coloured figure. The two submarginal cells are naturally separated by the lower branch of the 2nd longitudinal vein, the upper cell being the shorter. The petiole of the 2nd posterior cell is much shorter than the cell.

397. **Eriocera semilimpida**, *Brun.* (Pl. X, fig. 17.)

Eriocera semilimpida Brunetti, Rec. Ind. Mus. vi, p. 311 (1911).

♂. *Head* wholly black, vertical protuberance with some black hairs; antennæ black, shortly pubescent; palpi nearly black. *Thorax* shining black, with some dark brown hairs about the sides; mesonotal suture deeply cut; greyish reflections behind and below base of wing; scutellum shining black, with soft black hairs; metanotum shining black. *Abdomen*: 1st segment livid on basal half, remainder black; next four segments reddish orange, hind borders a little darker, that of 5th blackish; rest of abdomen black, including the genitalia, which are of moderate size, the only obvious parts being a tolerably large pair of claspers. Belly mainly as dorsum, 1st segment all black, 2nd black except at base. *Legs* wholly black, shortly pubescent. *Wings* dark grey, slightly tinged with yellowish; costal cell, 5th longitudinal vein, and distal part of wing from about the inner side of discal cell, rather dark brown, the colour extending not quite so far proximally into the marginal and 5th posterior cells; hind basal corner of wing more or less brown. Inner cross-vein placed soon after origin of 3rd vein, and before fork of 2nd; branches of 2nd rather close together, fork of upper branch occurring before one-fourth the length of that branch; discal cell 6-sided; upper branch of 4th vein forked near tip, making five posterior cells; the three veinlets from the discal cell equidistant; outer cross-vein just beyond middle of discal cell. Halteres black.

Length 12 millim.

Described from one male in the Pusa collection, taken in the Khasi Hills, ix. 1906, and a second specimen from Nongpoh, Assam, vi. 06.

Type and second example in the Pusa collection.

This species bears close general resemblance to *E. bicolor*, Macq., but there are several quite good points of difference between them. In *E. semilimpida* the head is black, not greyish; the thorax shining black unmarked, not brownish grey with three black bands and some small spots; the basal segment of the abdomen is black, not orange; the coxæ black, not tawny; the costa dark brown throughout its length, not clear on the whole proximal half, as distinctly mentioned by Macquart and illustrated in his plate; and the whole proximal two-thirds of the wing (apart from the costa) in my species is pale grey, whereas in *E. bicolor* the whole wing is brown, with a broad clear median band, and a narrower one at the base. The venation is identical in the two species.

398. **Eriocera tuberculifera**, *Edw.*

Eriocera tuberculifera, Edwards, Ann. Mag. Nat. Hist. (8) viii, p. 66 (July 1911).

♀. "*Head* orange yellow. Front with a pair of very prominent tubercles just above the antennæ, and above these with a smaller median tubercle. Antennæ with the basal half ochreous yellow, the apical half dark fuscous. *Thorax* fuscous brown; mesonotum yellow in front, the yellow colour not extending as far back as the suture. *Abdomen* orange ochreous, with a dark lateral line. *Legs* uniform ochreous. *Wings* uniform ochreous brown, very like those of the preceding species." * (*Edwards.*)

Length 14–17 millim. (without ovipositor); of wing 14–17 millim.

Described from two females at Pundaluoya, Ceylon (*E. E. Green*), taken in Nov. 1888 (*type*) and July 1889.

Type in the British Museum.

399. **Eriocera albonotata**, *Lw.*

Limnobia albonotata, Loew, in Peters' Naturwiss. Reise nach Mozambique, Zool. v (Insecten) (1862).

♂ ♀. "*Head* black; rostrum, palpi, and antennal scapus brown; flagellum yellowish; thorax black or deep brown (in the female specimen); halteres brown. *Legs* brownish yellow; coxæ black; tip of femora, extreme tip of tibiæ and the tarsi (especially at the tips of the joints) brown. *Abdomen*: 1st segment black or brown; the two (♀) or three (♂) following segments yellow, with a more or less black line along the lateral edge of the segments; the rest black; in the female the ovipositor and the segment bearing it are ferruginous. *Wings* of a rather uniform brown, slightly paler in the axillary and spurious cells; (in the male specimen the centre of nearly all the cells is a little paler); a small white drop near the margin of the wing, between the tips of the 1st and 2nd veins; a similar drop, but much smaller, between the tips of the two branches of the second vein; an almost semicircular spot, just below the apex of the wing; on the margin at the distal ends of the second submarginal and of the first posterior cells; four posterior cells.

"*Length* 19–20 millim.

"*Hab.* Ceylon: ♂, Peradeniya, Oct. 10 (*Mr. A. Humbert*); ♀, Cannia, near Trincomalie, July 30. Two specimens, ♂ ♀, Museum of Geneva.

"Two specimens from Ceylon in the Berlin Museum (*Nietner*) agree with the above description exactly, except that the abdomen is of a uniform colour, deep black in one specimen, brown in the other; I suppose it is merely a variety." (*Osten Sacken.*)

From a male and female in the Indian Museum the following notes are drawn up:—

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* *E. scutellata*, Edwards.

Length 17 millim. (+3 mm. ovipositor in female). *Head* blackish grey, frons forming one-third the width of the head, moderately prominent; palpi black. Antennal scape black, 2nd joint very short, flagellum reddish yellow each of the first two joints about as long as the 1st scapal joint, the four remaining joints shorter. *Thorax* wholly deep black. *Abdomen* mainly black, flattened, considerably widened towards, but not actually at, the tip; 2nd and 3rd segments (♂ ♀) bright lemon-yellow, 4th yellow, with narrow posterior black border (♂) or mainly yellowish about its dorsum (♀); rest of dorsum black, except that in the male the base of the 5th segment is a little yellowish; a very narrow black line along the sides of the two yellow segments, which are also wholly yellow on the underside; rest of belly black. Ovipositor black at base, rest reddish yellow; upper valves much the longer. *Legs* with coxæ black, femora and tibiæ brownish yellow, both with a very narrow black apical ring; tarsi black. *Wings* dark brown; a small semicircular white spot over tip of 3rd vein; a much smaller one towards tips of both marginal and 1st submarginal cells, the latter one very minute. Posterior cross-vein nearly at the end of the discal cell in one wing and exactly in a line with its base in the other.

The two specimens from Maskeliya, Ceylon (*E. E. Green*).

400. **Eriocera testacea**, sp. nov.

♀. This species, although differing from *E. tenuis* in general appearance, is difficult to differentiate in detail from it, and as it was taken in the same locality and month by the same collector, it may possibly be the female of that species. The antennal flagellum is pale yellow; the thorax is black, more dusted with grey at the sides; the scutellum and metanotum grey. The 1st abdominal segment is black, the remainder brownish, the tip blackish, the ovipositor reddish brown. The legs as in *E. tenuis*, but paler yellow. The wings coffee-brown; the venation identical, but no apical white spot, and the centres of most of the cells on the posterior half of the wing are rather clearer.

Length 24 millim. to tip of ovipositor.

One female in the Indian Museum from the Nilgiri Hills, iv. 1910 (*H. L. Andrewes*).

Family RHYPHIDÆ.

Flies of moderate size, or small, with an appearance partaking of that of the TIPULIDÆ, as well as of the MYCETOPHILIDÆ. *Head* hemispherical, eyes rounded, contiguous in male and wide apart in female (in *Rhyphus*); in one genus * the frons is wide in both the sexes. Ocelli present. Proboscis moderately prominent (*Rhyphus*) or hardly at all prominent (*Olbiogaster*); labella small. Palpi 4-jointed, rather long (*Rhyphus*), or short (*Olbiogaster*). Antennæ about as long as the thorax, 16-jointed, the two basal joints differentiated; the flagellum in *Rhyphus* composed of compact annular or cylindrical joints placed rather closely together, whilst in *Olbiogaster*, a Mexican genus, the flagellar joints in the male are filiform. *Thorax* without transverse suture, oval, arched; scutellum transverse, moderate in size; metanotum well developed. *Abdomen* flattened, cylindrical, seven-segmented; genital organs hardly prominent. *Legs* moderately long and slender; tibiæ without terminal spurs, or the hind pair sometimes with minute ones; pulvilli absent, empodium pulvilliform. *Wings* comparatively large and broad, folded over the abdomen, when in repose; in most species they are faintly marmorated or marked with pale grey and darker brown spots and short bands. Auxiliary vein present; 2nd longitudinal vein simple, discal cell always present; 4th vein with both its upper and lower branches forked; 5th, 6th and 7th veins distinct, long, the latter moderately abbreviated.

The family is represented in Europe, North and South America, West Africa, the Orient, Tasmania and New Zealand.

The RHYPHIDÆ, as compared with the other families of NEMATOCERA, except many TIPULIDÆ, are distinguished by the presence of the discal cell in the wings; the TIPULIDÆ, in which it is normally and generally present, being the only other family in this suborder possessing it. In addition the present family has a peculiar venation, which in some respects appears as if it were related to that of the LEPTIDÆ, amongst the BRACHYCERA. The resemblance is further heightened by an apparent affinity between the antennæ of *Rhyphus* and those of one or two genera of LEPTIDÆ, *Xylophagus* for example; but the student may at once distinguish between the two by the shape of the anal cell, which in RHYPHIDÆ is wider towards the posterior margin, whereas in LEPTIDÆ it is much narrowed distally or actually closed.

* *Olbiogaster*, Os. Sac., a non-Oriental genus, to which is allied a very similar one, *Lobogaster*; these three genera comprising the whole of the RHYPHIDÆ.

Genus RHYPHUS, *Latr.*

Sylvicola, Harris, Expos. Engl. Ins. p. 104 (1776).
Anisopus, Meigen, Illig. Mag. ii, p. 264 (1803).
Rhyphus, Latreille, Hist. Nat. Crust. et Ins. xiv, p. 291 (1804).

Genotype, *Tipula fenestralis*, Scop.

Head nearly hemispherical. Eyes large, bare, nearly round; contiguous in the male, widely separated in the female. Ocelli distinctly present. Proboscis moderately prominent, with small labella; palpi rather long, four-jointed, the 2nd joint the longest and broadest. Antennæ about as long as the thorax, 16-jointed; the two basal or scapal joints differentiated; those of the flagellum cylindrical, moderately short, placed rather closely together, shortly pubescent. *Thorax* arched, oval, with but little pubescence. Scutellum semicircular, short and broad; metanotum well developed. *Abdomen* somewhat flattened, subcylindrical, of seven segments. Genitalia hardly prominent. *Legs* slender but comparatively long, nearly bare, unspined; tibiæ without apical spurs, or at most the hind pair with very small ones; metatarsus lengthened, empodia pad-like, pulvilli absent. *Wings* comparatively large and broad, folded over the abdomen in repose. Auxiliary vein ending about the middle of the wing; the 1st and 2nd longitudinal veins both ending at short distances beyond, all terminating in the costa, the 1st nearly parallel to the auxiliary, the 2nd trisinnate, originating some distance before the middle of the wing (in *R. maculipennis*, Wulp, only very shortly before the middle); the 3rd vein emerges from the 2nd at a little beyond the base, being gently bisinuate or nearly straight and ending at or before the tip of the wing; anterior cross-vein very short but distinct, always above the middle of the discal cell; the 4th vein with both branches forked, the upper one at the outer corner of the discal cell, the lower branch at or before the middle of that cell, which latter is six-sided; the cell twice or three times as long as wide, the four endings of the 4th longitudinal vein gently divergent or parallel; the 5th vein sinuate beyond the posterior cross-vein which is always placed just beyond the fork of the lower branch of the 4th vein; 6th vein gently curved or nearly straight; 7th rather short, nearly straight.

Life-history. The works of Réaumur,* Latreille and Dufour † may be consulted on this subject, and especially that of the more recent writer Perris,‡ who describes the larva and pupa of *R. fenestralis*, Scop.

The larva lives in decomposing damp vegetable matter and is about 10 millim. long (Dufour said 14 to 15), apodal, cylindrical, smooth and shining dirty white in colour. It is of thirteen segments,

* Mémoires pour serv. à l'hist. des insectes (1734–42).
† Ann. Soc. Ent. France, (2) vii, p. 195, pl. vii, pt. 3, figs. 1–7 (1849).
‡ Ann. Soc. Ent. France, (4) x, p. 190, pl. ii, figs. 54–61 (1870).

according to Dufour, but Perris illustrates fifteen, those three following the head being regarded as thoracic segments. These latter are ornamented by four elongated black marks on each, longitudinally placed (Perris does not show them). The head is bluntly oval, horny, ferruginous, possessing on each side a thick blunt projection bearing a minute one-jointed antenna. A pair of two-jointed elongate palpi, a middle lip-like piece below the somewhat projecting centre of the anterior border of the head, and a pair of small palp-like organs outside of the palp, complete the head appendages. Two small black eye-spots on the dorsum of the head.

The larva emerges from its food-bed to pupate, fixing itself to something for the purpose. The pupa is 10 millim. long, bare, obvolute, elongate subcylindrical, reddish in colour, with rows of short bristles around the segments. A broad thoracic portion, of which the anterior third is depressed, forming the head, which is flattened considerably and bears below a radiating circle of stiff hairs. A large ear-like projection on each side of the thoracic section. Dufour gives good figures of the pupa.

The perfect insects are found generally distributed, one species, *R. fenestralis*, being fairly common, though rarely abundant, on the windows in houses in Europe and North America. Other species are sylvan and perform aerial dances under trees by the side of roads in woody regions.

No less than six species of *Rhyphus* from the East have come before me, including the only one previously recorded (*R. maculipennis*, Wulp); a European species, *R. punctatus*, F., about the identification of which there can be little doubt; and also a variety of the common European *fenestralis*, Scop.

All these forms are rather easily separated by the following characters :—

Table of Species.

1. Antennæ conspicuously vari-coloured. . . . 2.
   Antennæ wholly black . . . . 3.
2. Subapical clear spot in wing (at tip of 2nd longitudinal vein) elongated, and entirely clear . . . . *maculipennis*, Wulp, p. 552.
   The above spot nearly circular, and enclosing a distinct round dark spot. *pulchricornis*, Brun., p. 553.
3. Thorax bluish ash-grey with chocolate-coloured stripes . . . . 4.
   Thorax yellow, or brownish yellow, with reddish brown stripes . . . . 5.
4. Wing more deeply and extensively marked; distinct blackish spot at tip, whole distal margin more or less light blackish grey . . . . *fenestralis*, Scop., var. *indicus*, [Brun., p. 554.
   Wing much less deeply marked, and quite clear on distal portion, beyond the cross-veins; no apical spot whatever . . . . *punctatus*, F., p. 555.

5. Costa darker, towards tip of wing showing distinctly a quite clear square spot, only descending to the 3rd longitudinal vein, with a smaller contiguous spot below; a distinct, narrow brown streak beyond posterior cross-vein; distal part of wing below 3rd longitudinal nearly clear, with posterior veins very lightly suffused . . . . *distinctus*, Brun., p. 556.

Costa much lighter, showing towards tip of wing only one, much less clear, oval spot, always descending below 3rd longitudinal vein, without any second spot adjacent; no brown streak outside posterior cross-vein; distal part of wing below 3rd longitudinal very slightly darker grey, and this towards the margin only, the posterior veins not individually suffused . . . . *divisus*, Brun., p. 557.

401. **Rhyphus maculipennis**, *Wulp*. (Pl. XII, fig. 1.)

Rhyphus maculipennis, van der Wulp, Notes Leyd. Mus. vii, p. 14 (1885); id., Tijd. Ent. xxviii, p. 87, pl. iv, fig. 9, and *op. cit.*, xxxviii, p. 41, pl. ii, fig. 8.

♂ ♀. *Head* brownish yellow; ocellar triangle dark brown; a narrow line extending from it nearly to the base of the antennæ. Frons with a few black hairs on vertex, and pale yellow hairs below; a small brown spot on the face between the base of the antennæ and the eye-margin. Antennæ vari-coloured; scape and basal half of flagellum brownish yellow, more or less marked with brown, at least on the upperside; 7th and 8th joints blackish, 9th and 10th pale yellowish white, 11th to 14th black, apical joint yellowish. Proboscis dark brown; palpi brownish yellow. *Thorax* yellowish with some pale yellow hairs and with three dark brown stripes of the usual pattern, the median one attaining the anterior margin; an indistinct and irregular narrow brown streak along the edge of the dorsum. Scutellum brownish. *Abdomen* pale yellowish, with a black posterior border to each segment, narrow on the 1st and 2nd, half the width of the 3rd segment and nearly filling the dorsum of each of the remaining segments; a little pale pubescence on the abdomen. Belly practically the same as the upperside. *Legs* yellowish; tips of femora and tibiæ, and the major part of the tarsi brown or brownish. *Wings* pale grey, beset with very small but distinct short hairs; three moderately wide brown bands from the costa, the first ending at the discal cell, the third apical, the second intermediate between the two; the second and third fading away at about the same distance from the costa as the first; costal cell a little yellowish, as is also the base of the 1st basal cell; a short

brown band across the middle of this cell; the borders of the discal cell and the 5th longitudinal vein narrowly suffused with brown. The veins appear generally liable to a slight suffusion, and the hinder part of the wing is a little darker grey distally. Halteres yellowish with brown tips.

Length $3\frac{3}{4}$ millim.

Described from a female in the Indian Museum collection, dated 30. vii. 10 (no locality given, but probably Assam), and one in my own collection from Peradeniya, Ceylon, xii. 07; in the former specimen both the hind legs are missing.

The wing agrees perfectly with van der Wulp's plate. The antennæ and abdomen in his type specimen were injured and he described the male only. Of the antennæ, the first three joints (not two, as he says *) are yellow, joints 4 to 8 yellow with brownish marks, or wholly brownish, 9 and 10 quite black, 11 and 12 yellowish white, 13 to 16 quite black, the 16th with a short white style. The two basal abdominal segments are mainly dirty yellow, with black posterior borders, the remainder being brownish yellow with broadly black borders; the apical segments wholly blackish. Belly similar. The palpi are black. Wulp described his male from Java.

402. Rhyphus pulchricornis, *Brun.* (Pl. XII, fig. 2.)

Rhyphus pulchricornis, Brunetti, Rec. Ind. Mus. iv, p. 260 (1911).

♀. *Head*: frons fully one-third width of head, reddish yellow, bare; vertex with a few hairs; ocellar triangle small, black, isolated. Antennæ long, 16-jointed, variegated, the joints mostly reddish yellow and black, with a short white style and two or three bristles at the apex; joints 1, 2, 3 reddish yellow; 4, 5 quite black; 6, 7, 8 reddish yellow; 9, 10 black; 11, 12 brownish yellow; 13 to 16 black; the appearance of the antenna suggesting that it is liable to variation. Palpi bright reddish yellow, with a few bristles; proboscis very short, yellow. *Thorax* yellowish, with three wide, dark, soft reddish-brown stripes; sides yellow, with black streaks; some bristles on the dorsum. Scutellum yellow, with a few bristles. *Abdomen* brownish yellow, blackish towards tip, posterior borders of basal segments widely black. Belly apparently concolorous. *Legs* brownish yellow, minutely pubescent; tips of the femora, of the tibiæ, and of the tarsal joints blackish. *Wings* pale grey; anterior border a little yellowish on the basal half; posterior border pale blackish, slightly deeper at tip; a dark irregular band from the costa, reaching to the discal cell, and another, of about equal width, placed between the first and the infuscated wing-tip; the clear space immediately adjoining the infuscated wing-tip encloses a pale blackish oblong spot placed lengthwise on the costa; outer side of the discal cell with a black suffusion; a black round spot in the 1st basal cell;

* Quite possibly a variable character.

posterior cross-vein and the anal vein narrowly suffused with black. Halteres pale yellowish brown.

Length $3\frac{1}{2}$ millim.

Described from a specimen in good condition in the Indian Museum collection, from Siliguri, 18–20. vii. 07.

This species is very near *R. maculipennis*, Wulp, but I believe it is quite distinct, differing in the wing marks and in the wholly yellowish hind femora, these joints in Wulp's species having a black ring in the middle. The palpi, too, in Wulp's species are blackish, and the thorax is described as yellow with *black* stripes.

403. **Rhyphus fenestralis**, *Scop.* var. **indicus**, *Brun.* (Pl. XII, fig. 4.)

Rhyphus fenestralis, var. *indicus*, Brunetti, Rec. Ind. Mus. iv, p. 261 (1911).

References to typical form.

Tipula fenestralis, Scopoli, Entom. Carn. p. 322 (1763).
Sylvicola brevis, Harris, Expos. Engl. Ins. p. 104, pl. xxxi, fig. 3 (1776).
Anisopus nebulosus, Meigen, Klass. i, p. 103, ♀ (1804).
Rhyphus fenestralis, Schiner, Fauna Austr., Dipt. ii, p. 495 (1864).*

♂ ♀. *Head* dusted with light grey. *Eyes* in male quite contiguous for a considerable distance, in female separated by a frons about one-fourth to one-fifth the width of the head; ocelli placed on a small protuberance; proboscis and palpi blackish brown. Antennæ black. *Thorax* pale bluish ash-grey, varying to yellowish grey, with three chocolate-coloured stripes of the usual pattern, the median one attaining the anterior margin; sides of thorax concolorous, with a more or less distinct brownish line from the base of the wing to below the shoulder. Scutellum yellowish, more or less dusted with grey; metanotum dusted with grey or bluish grey. *Abdomen* dark brown, with pale yellow pubescence, posterior borders of segments narrowly yellowish, often the whole abdomen blackish, but in most specimens the basal segment quite pale. Belly yellowish. *Legs* yellow, posterior femora and tibiæ narrowly black at tips, hind femora often with a broad brownish more or less distinct band in the middle; tarsi blackish towards tips. *Wings* nearly clear; stigma dark brown (or black in life), enclosed by the turned-up tip of the 2nd longitudinal vein; the apical (more correctly, subapical) spot encloses the 3rd vein just before its tip, and above this vein the spot reaches the wing-border, but below the vein the spot ends abruptly a little way before the wing-border.† The wing is dark brown, narrowly

* For full references to this frequently described species, see Katalog. Dipt. i, p. 305.

† In some specimens the spot is roughly triangular, as in typical *fenestralis*, which serves to prove that the present form is more likely to be a variety only than a distinct species.

infuscated over the 2nd longitudinal vein just beyond the præfurca, on the base of the 3rd vein, on the anterior and posterior cross-veins, and on the outer side of the discal cell; whilst very pale brownish infuscations of larger extent occur below the stigma, contiguous to it, more or less over the middle portions of the longitudinal veins from the 4th, more conspicuous on the two upper branches of this vein, and on the two branches of the 5th. Halteres pale yellowish.

Length 4–5 millim.

Described from several specimens of both sexes in the Indian Museum from Simla, 7000 ft., 24. iv. 07 and 10. v. 09, and Matiana, Simla district, 8000 ft., 28–30. iv. 07 (both *Annandale*); Darjiling, 5–9. viii. 09 (*Paiva*); Kurseong, xi. 1910 (*D'Abreu*); also from Ukhrul, Manipur, Assam, 6400 ft. (*Pettigrew*).

The main difference in this variety, which I am almost inclined to rank as a separate species,* from typical *fenestralis* is the colour of the thorax, with its stripes, and the wing-markings. The apical wing-spot in *fenestralis* (typical) (Pl. XII, fig. 3) is brownish, its inner sides forming a right angle, and at the edge of the wing the spot extends distinctly below the 3rd longitudinal vein; whereas in *indicus* (in life) it is much blacker,† the edge is much more clearly cut, and the distal half of the spot does *not* extend below the 3rd longitudinal vein, although above this vein it reaches the wing-tip as usual, so that the inner sides of this spot do not form a right angle, but are irregular.

404. **Rhyphus punctatus**, *F.* (Pl. XII, fig. 5.)

? *Musca nigricans*, Linnæus, Fauna Suec. ed. ii, p. 553 (1761).
Rhagio punctatus, Fabricius, Mant. Ins. ii, p. 333 (1787).
Musca bilineata, Gmelin, Syst. Nat. v, p. 2866 (1792).
Anisopus nebulosus, Meigen, Klass. i, p. 103, pl. vi, fig. 5, ♂ (1804).
Sciara punctata, Fabricius, Syst. Antl. p. 59 (1805).
Rhyphus marginatus, Say, Jour. Acad. Sci. Philad. iii, p. 27 (1822), and Compl. Writ. ii, p. 50 (1859); Weidemann, Auss. Zweifl. i, p. 82 (1828).
Rhyphus punctatus, Schiner, Faun. Austr., Dipt. ii, p. 495 (1864).

♂ ♀. *Head*: vertex blackish grey, with a few bristles. Proboscis and palpi blackish brown. Antennæ black, extreme tips of scapal joints slightly whitish. *Thorax* moderately light grey, with pale hairs; the usual three dorsal dark stripes, the outer ones considerably shorter, the median one attaining the anterior margin; the hinder part below the dorsum yellowish; scutellum grey. *Abdomen* moderately dark brown, with rather numerous yellow hairs; hind margins of segments pale yellowish. Belly

* The comparison was made between the set of Indian examples mentioned, about twenty in number, and a number of European female specimens in the Indian Museum, and my own collection from England, Wales, Scotland, and Austria.

† The colour fades to brown in specimens a year or more old, and perhaps this is the case with most species of *Rhyphus*.

similarly marked; the lateral edges of the segments with a narrow yellow stripe. *Wings* pale grey, nearly clear; stigma dark brown, distinct, a slight brownish streak below it; a small deep blackish-brown longitudinal streak below the auxiliary vein, near its tip, the colour continued in diminishing intensity across the tip of the 1st basal cell; a brownish spot at about the middle of the 1st basal cell; the "cross-veins" are a little darkened and thickened. Halteres pale yellow.

Length 4 millim.

Redescribed from specimens in the Indian Museum, which include three females from Kurseong, 9–26. ix. 09 (*Lynch*, *Annandale*); also from a male and female from Burley in Wharfdale, England, vii. 1900, and a female from Morningside, near Edinburgh, 19. ix. 94 (*P. H. Grimshaw*).

The species is moderately common throughout Europe, and occurs also in North America (Virginia), where it is said to have been bred from cow-dung.*

Type. The location of this is unknown to me.

405. **Rhyphus distinctus**, *Brun.* (Pl. XII, fig. 6.)

Rhyphus distinctus, Brunetti, Rec. Ind. Mus. iv, p. 262 (1911).

♂ ♀. *Head*: eyes absolutely contiguous in male from the conspicuously raised ocellar triangle, which occupies the whole vertex, almost to the base of the antennæ; underside of head blackish grey. Frons in female one-fourth the width of the head, and, with vertex and face, whitish grey; underside of head somewhat yellowish. Antennæ wholly black, with a little short grey pubescence, tips of both scapal joints sometimes narrowly brownish yellow; palpi black. Back of head with some soft long hairs; proboscis yellowish. *Thorax* brownish yellow, with three moderately broad, somewhat reddish brown stripes, the outer ones extending from just below the anterior margin nearly to the posterior one; the middle stripe extends from the anterior margin nearly to the scutellum, tapering gradually, often narrowly divided in front; there is also a small unicolorous transverse mark just below each shoulder. A dorso-central row of stiff hairs, gradually diminishing in length, extends from the posterior margin forwards, thence curving towards and over the humeral swellings; a lateral row of six or seven long stiff hairs above each wing, and some postalar ones. Scutellum brownish yellow, with a broad median brown band, and the extreme edges brown; metanotum shining dark brown. *Abdomen* dark reddish brown, with a moderate amount of soft short yellow hair; hind margins of segments more or less narrowly yellowish, sometimes the posterior corners also; basal segment sometimes lighter coloured. Belly yellowish, with more or less dark markings; genitalia inconspicuous. *Legs* light brownish yellow; tarsi dark; extreme tips of posterior femora black:

* Howard, Canad. Ent. xxxiii, p. 43.

there is generally a more or less distinct broad irregular blackish band occupying about the middle third of the hind femora, and the hind tibiæ are more or less blackish for some distance at both base and tips; legs minutely pubescent. *Wings* very pale grey, with brownish markings; the cross-veins rather deeply but narrowly brown, whilst moderately dark brownish markings occur as follows:—a square mark in the middle of the upper basal cell; a well-defined brown streak from the middle of the costa, narrowing gradually, passing between the above-mentioned square mark and the anterior cross-vein, crossing the base of the discal cell and continuing narrowly along the 5th longitudinal vein; a broader, also well-defined, stripe from the costa (narrowing hindwards) passing clear of the posterior cross-vein, terminating at the upper fork of the lower branch of the 4th longitudinal. The tip of the wing down to the 3rd longitudinal vein is brown, leaving in front of it a distinct square-shaped, quite clear spot, touching the costa and contiguous to the previously described stripe. It may be described differently by saying that the whole of the costa is brownish, deepening towards the tip, with a quite clear square spot placed just touching the tip of the 2nd longitudinal vein, extending from the costa to the 3rd longitudinal. The distal part of the wing, from below the 3rd longitudinal down to a little beyond the lowest branch of the 4th, is light brownish grey, leaving a clearer streak across the 1st, 2nd, and 3rd posterior cells, just before their centres and almost below, but a little previous to, the clear square costal spot. Nearly below this latter spot, but a little beyond it, yet just touching it in the 1st posterior cell, is a nearly upright, oblong, quite clear spot, on the outer side of which the brown colour is distinctly deeper for a very small space. The 6th longitudinal vein is very narrowly and not deeply suffused. Halteres yellowish.

Length 3–4 millim.

Described from a number of both sexes from Darjiling, 7000 ft., 5–8. viii. 09 (*Paiva*), and a female from Kurseong, 2000 ft. below Darjiling, 4. ix. 09 (*Annandale*). I have also seen a specimen from Kowpati, Mangaldai, Assam, 12. xii. 10 (*Kemp*).

Types in the Indian Museum.

406. **Rhyphus divisus**, *Brun.* (Pl. XII, fig. 7.)

Rhyphus divisus, Brunetti, Rec. Ind. Mus. iv, p. 263 (1911).

♂ ♀. This species considerably resembles *R. distinctus*, but differs in some minor characters, and very essentially in the wing markings. The row of stiff hairs behind the eyes and across the vertex is stronger; the basal abdominal segments in the male are more yellowish on their posterior borders, and the middle line on the thoracic dorsum is very distinctly divided; the blackish band on the hind femora is confined to the male, whereas in *R. distinctus* it is sometimes present, though indistinctly, in the female. The wing markings are entirely different: on a pale grey ground-

colour, the cross-veins are deeply but narrowly infuscated, as is also the 5th longitudinal vein; the proximal two-thirds of the marginal cell is rather deeply blackish, with a slightly paler spot in a line with the posterior cross-vein; the distal part of the wing is light blackish grey, much deeper at tip just above the 3rd longitudinal vein and a little below it, leaving a nearly clear oval spot touching the costa, at the tip of the 2nd longitudinal and extending downwards into the 1st posterior cell; a second, much fainter and more irregular clear spot occurs just beyond the posterior cross-vein; the præfurca appears slightly obliterated about its middle. Halteres yellow.

Length $3\frac{1}{2}$–5 millim.

Described from a good series of both sexes in the Indian Museum from the following localities:—Darjiling, 7000 ft., 5–12. viii. 09 (*Jenkins* and *Paiva*, common); Kurseong, 10–26. ix. 09 (*Lynch*); Gangtok, Sikkim State, 9. ix. 09; also two pairs taken *in cop.*, Darjiling, 5. viii. 09, and Gangtok, 6150 ft., 8. ix. 09. An apparently immature specimen from Phagu, Simla hills, 12. v. 09 (*Annandale*).

Types in the Indian Museum.

A male and two females, taken at Darjiling in company with the others, have the thoracic markings almost obliterated, and the

Fig. 44.—*Rhyphus divisus*, Brun., ♂.

clear parts of the wing more extended, but they apparently belong to the same species.

Of the three species (*R. fenestralis*, *distinctus*, and *divisus*) taken by Mr. Paiva at Darjiling in August 1909, he says that some were taken on windows and others along the roads of the town, where they were hovering in small swarms under the shade of the trees, but it would be impossible to say now whether all the species occurred in both habitats or not, as at the time of collecting identification was impracticable.

APPENDIX

Family MYCETOPHILIDÆ.

Subfamily CEROPLATINÆ.

Isoneuromyia rufescens, sp. nov.

♀. Very near *I. annandalei*, Brun.

This species differs in the following characters: (1) the antennæ are wholly black, not reddish brown, being a little shorter and their tips less pointed; (2) the palpi (except the brownish yellow 1st joint) are black, not wholly light brownish yellow; (3) the underside of the head is black with very little white tomentum or dust, instead of (as in *I. annandalei*) brownish yellow with conspicuous snow-white dust below the antennæ for a considerable space; (4) there is much less yellow about the shoulders; (5) the basal half of the anterior femora is black; (6) the abdomen, after the two basal segments, is reddish brown, not black, with only traces of pale basal bands on the segments, except on the 2nd segment, where the band is tolerably obvious.

Described from one female in the Indian Museum from Simla 7000 ft., 20. vii. 11 (*Annandale*).

Possibly a variety of *I. annandalei*, but I think distinct.

Subfamily MYCETOPHILINÆ.

Genus **EURYSCHALIS**, gen. nov.

GENOTYPE, *Euryschalis spectralis*, sp. nov.

Near *Cœlosia*, Winn., and *Phronia*, Winn.

Head rounded, flattened in front, not placed low on the thorax. Eyes oval, emarginate at base of antennæ; three ocelli, arranged in the form of a flattened triangle, equidistant from one another, the outer ones at some distance from the eye margins. Palpi

incurved, four-jointed, cylindrical, slender, the joints approximately equal in length. Antennæ with very short scapal joints, bead-like; flagellum long, of fourteen cylindrical pubescent joints, the first one distinctly the longest. *Thorax* highly arched, ovate, with moderately strong bristles towards the margins of the dorsum; scutellum small, semicircular; metanotum high. *Abdomen* six-segmented, slender, linear, flattened; genitalia large and prominent. *Legs* long and slender; fore tibiæ without setæ; posterior tibiæ with two rows of weak, short, but distinct setæ; all tibiæ with two apical spurs of unequal length. *Wings* reaching to about the tip of the abdomen, oval, normal. Auxiliary vein distinct, ending in costa approximately opposite origin of 3rd vein; 1st longitudinal vein long and straight, ending at about two-thirds of the wing; 3rd vein beginning near middle of wing at a sharp rectangle, thence running straight to the wing-margin, which it reaches before the wing-tip and a little before the termination of the costa; anterior cross-vein rather long and oblique; 4th longitudinal vein forking a little after origin of 3rd vein, the branches gently diverging; 5th vein forking beyond fork of 4th vein, the branches very widely diverging; 6th and 7th veins incomplete, not reaching more than half-way to the wing-margin, the former close to and parallel with the 5th vein, the latter close to and parallel with the anal lobe of the wing.

Euryschalis spectralis, sp. nov.

♂. *Head* and palpi moderately dark dusky brown, the occiput with stiff pale yellow hairs. Antennal scape yellow, the flagellum with the two or three basal joints yellowish, the remainder dusky brown with whitish grey pubescence. *Thorax* yellowish, with three dark brown dorsal stripes of the usual pattern, the median one only reaching the anterior margin, and composed of two stripes closely attached. Two dorso-central rows of pale yellow hairs, situated between the dorsal stripes, whilst a 3rd row of microscopic setæ is placed along the middle of the median stripe; strong bristles placed laterally on the thoracic margins and two or three bristles occur below each shoulder; three are pl ced on each hind corner of the dorsum, the middle one at the extreme corner, and two strong bristles are on the hind margin of the scutellum, which is yellowish, with some smaller ones; metanotum yellowish, hind surface brown. *Abdomen* yellowish, but dark brown about the basal half of each segment, the whole of the 6th segment brown above; belly more or less similar to upperside. Genitalia large and conspicuous, yellowish; a very large pointed dorsal plate ending in a black, apparently horny tip, and a pair of large two-jointed claspers, the basal joint approximately ovate, the 2nd much smaller, more cylindrical but nearly as long; some inner appendages are apparent, and the whole of the genital organs are pubescent. *Legs* brownish yellow, knees and tarsi blackish; setæ in accordance with the generic characters. *Wings* pale yellowish grey; an

indistinct narrow linear infuscation giving the appearance of an additional vein, between the 3rd vein and upper branch of the 4th, between the two branches of the 4th, and between the lower branch of the 4th and the 5th vein ; the apical half of the 5th vein before the fork and the whole of its lower branch very narrowly but distinctly tinged with dark brown. Halteres yellowish.

Described from a single male in the Indian Museum from Kurseong, 16. iv. 11 (*Annandale*).

Family BIBIONIDÆ.

Bibio flavohirta, sp. nov.

♂. *Head* black ; eyes sparsely and shortly hairy ; back of head and underside with black pubescence. Antennæ missing, except the black scape ; palpi black, hairy. *Thorax* black ; dorsum shining, with moderately dense dark brown hairs ; scutellum similar, metanotum bare ; sides of thorax with yellowish hairs. *Abdomen* black, rather dull, with rather long and dense yellow hairs on dorsum and sides ; sparsely hairy on belly except towards tip. Genitalia black, normal. *Legs* shining dark brown with short black hairs except on the coxæ, where the hair is yellow ; knees pale. *Wings* grey, anterior part a little darker : costal cell with a slight yellowish tinge ; stigma distinct, dark brown, oval, of moderate size. Veins on posterior half of wing pale yellowish ; basal sections of 3rd vein equal in length to the anterior cross-vein. Halteres dark brown, with a few pale hairs.

Described from a single male in the Indian Museum from the Darjiling district (*Lynch*).

Family SIMULIIDÆ.

Simulium striatum, *Brun.*

Simulium striatum, Brunetti, Spol. Zeyl. viii, p. 90 (1912).

♂. *Head* : frons shining leaden grey, with a few pale hairs, face of similar colour ; back of head light grey with sparse short pale hairs. Antennæ blackish, with light grey pubescence, the basal segments distinctly yellowish for some little distance, the

whole antennæ appearing in certain lights tinged with reddish yellow. Proboscis shining reddish yellow, with large oval grey hairy labella placed at the base. Palpi long, slender, blackish, the 1st joint not much thickened. *Thorax*: dorsum ash-grey, with scattered short bright yellow hairs, and three moderately narrow black stripes beginning just behind the anterior margin but not continued to the posterior one. Viewed from a low angle in front the dorsum appears blackish, with four ash-grey stripes of which the two outer ones are constricted in the middle on their outer edges. Sides of thorax blackish grey, with ash-grey reflections on the pleuræ. *Abdomen* dull black (apparently denuded of pubescence). *Legs*: coxæ and femora yellowish or brownish yellow, the latter more or less brown towards the tips, especially on the posterior legs. Fore tibiæ dark brown; posterior tibiæ pale yellowish on basal half, brownish or dark brown on apical half, the proportions being variable. Fore tarsi black, the metatarsus, 2nd and 3rd joints large; middle tarsi brownish yellow at the base, the joints very narrowly black-tipped, the last two or three joints wholly black, with no undue dilatation of any of the joints; hind metatarsus considerably incrassated, pale whitish yellow, with black tip, the next joint pale, narrowly black-tipped, the remainder black, the joints, except the apical one, dilated. *Wings* colourless, venation normal; halteres lemon-yellow.

Length 2 millim.

Described from five specimens taken by Mr. E. E. Green and Mr. Gravely at Peradeniya, 1500–1600 ft., Ceylon, vii. 1911 (*type*), xii. 10 and 2. vi. 10.

Type in the Indian Museum.

In one specimen the frons is of equal width throughout, in the others of triangular form, broad at the vertex and narrowing gradually to just above the antennæ. This is the case with the other species previously described by me, and it may be a question of shrinkage, the eyes in most females being much sunken in dried specimens. The striped thorax will distinguish this species at once from all other Oriental ones.

Family TIPULIDÆ.

Subfamily TIPULINÆ.

Genus **CTENACROSCELIS**, *End.*

Ctenacroscelis, Enderlein, Zool. Jahr. xxxii, p. 1 (1912).

GENOTYPE, *Ctenacroscelis dohrnianus*, End.

Head: antennæ of only twelve joints, the 12th not shortened nor club-like, and not bearing at the tip any minute 13th joint.

Clypeus conically produced as in *Tipula*. *Legs*: all the femora bear, on the upperside, towards the tip, a transverse row of distinct strong comb-like equidistant deep black spines. *Wings*: the 1st longitudinal vein ending in the 2nd longitudinal vein just before the latter forks, and not in its short upper branch as in *Tipula*; the usual small cross-vein (costal cross-vein) between the costa and the 1st longitudinal vein (near its tip), present; the 2nd longitudinal vein (following its whole course from its base to the tip of the lower branch) is conspicuously trisinuate, the lowest part of the lower branch being closely approximate to the middle of the 3rd vein; the 7th vein much shorter than in *Tipula*, but attaining the wing-margin. Venation otherwise as in *Tipula*.

Range. Sumatra, Darjiling.

The spined femora afford a very clear distinction from *Tipula*.

It has seemed advisable to redescribe this genus, partly because Dr. Enderlein adopts the (to me) objectionable Comstock-Needham system of venation; and also because he has mistaken the tip of the 1st longitudinal vein for a continuation of the small cross-vein connecting that vein with the costa. The 1st longitudinal vein in TIPULINÆ turns down into the 2nd vein, meeting this latter usually just beyond the fork, near the base of its upper branch, as explicitly stated by Osten Sacken in his Monograph of the North American TIPULIDÆ BREVIPALPI (p. 290). Moreover, Dr. Enderlein speaks of the discal cell being "petiolate," an expression which seems misleading, unless he refers to the petiole of the 2nd posterior cell.

Ctenacroscelis sikkimensis, *End.*

Ctenacroscelis sikkimensis, Enderlein, Zool. Jahr. xxxii, p. 4 (1912).

♂. "*Head* clear brownish yellow; frons more ochraceous, with a median impressed line; the elongate proboscis nearly twice as long as the rest of the head. Palpi brown; antennæ 12-jointed, clear brownish yellow, the first two joints [=the scape] ochraceous, the inner side of each scapal joint curved, the outer side straight. Antennæ 4½ millim. long, the head 5 millim. long. *Thorax* clear ochraceous yellow; dorsum on anterior half, except at the sides, dark greyish brown, with three indistinct yellowish stripes; at the sides of the prothorax a narrow brownish stripe towards the base of each wing. Metapleura with a brown spot anteriorly; prothorax wholly ochreous. Scutellum very flat, clear. Metanotum clear brownish yellow, with a greyish tinge. *Abdomen* greyish brown above, with a median yellowish stripe; belly pale brownish yellow. *Legs* clear brownish yellow, tips of femora brown; claws black, rather strong, with a moderately thick tooth at the base; all the other basal joints * somewhat emarginate on underside. *Wings* grey brownish, costal cell a little darker; the space between

* Presumably exclusive of the ultimate joint.

cu. 1 and cu. 2 [=5th posterior cell] tinged with brown; on the pterostigma [stigma] an elongate oval, sharply defined, clear brown spot; veins yellowish brown. The veinlet dividing the 4th and 5th posterior cells infuscated, together with the discal cell to a somewhat greater length than in *C. dohrnianus*. Membrane bare, with only a trace of reddish or greyish lustre.

"*Length* of body 30½ mm., of wing 37 mm., of fore femur 21 mm., of fore tibia 23 mm., of fore tarsus about 34 mm., of hind femur 24½ mm., of hind tibia 24½ mm., of hind tarsus 37½ mm.

"SIKKIM: Darjeeling, one ♂ (*Rolle*)." (*Enderlein.*)

Type in the Stettin Zoological Museum.

Dolichopeza postica, sp. nov.

♂ ♀. *Head* dark brown to blackish, more or less yellowish above and below the antennæ, and sometimes the lower part of the head yellowish also. Proboscis, palpi, and antennæ blackish brown, the latter normal, of thirteen joints, the last one very minute and not always obvious. *Thorax*: dorsum deep black, with three shining dark brown stripes of the usual Tipulid pattern, nearly contiguous; the median one occupying the whole anterior margin, barely narrowing at the suture; the outer, much shorter stripes also reach the suture. These stripes are in some specimens nearly black, in others rich shining dark brown. Behind the suture the dorsum is concolorous brown, with the sutural depressions blackish; the scutellum and metanotum are also concolorous; sides of thorax blackish brown. *Abdomen* blackish, minutely pubescent above; belly similar. Genitalia large, dark brown, pubescent; a pair of claspers with a very large basal joint and a slender finger-like second joint; there are also two pairs of slender inner hairy yellowish organs. Ovipositor of female normal, small, brownish yellow. *Legs* wholly moderately dark brown, microscopically pubescent; tips of femora and tibiæ blackish. *Wings* dark grey; stigma distinct, oval, blackish brown. The *hinder* branch of the upper branch of the 4th longitudinal vein is forked; the 3rd posterior cell about two and a half times as long as its petiole; posterior cross-vein in a line with origin of 2nd vein. Halteres black.

Length 5–7 millim.

Described from four males and two females, including the type male and female *in cop.*, from Ghumti, Darjiling district, 6000 ft., vii.1911 (*F. H. Gravely*).

Types in the Indian Museum.

The peculiarity of this species is that instead of the anterior veinlet, it is the *hinder* veinlet of the anterior branch of the 4th vein which is forked. This differentiates it from the other Oriental species, *D. orientalis*, *obscura*, and *infuscata*: also from *D. sylvicola*, Curt., of Europe, and at least *D. longifurca*, Skuse, and *varipes*, Skuse, from Australia. As, however, the rest of the venation agrees, and the antennæ are peculiarly typical of *Dolichopeza*, it is impossible to separate it generically.

Dolichopeza infuscata, sp. nov.

♂. *Head* yellow, with short stiff black hairs towards the sides of both frons and occiput. Proboscis yellowish, dark brown at tip, palpi dark brown. Scapal joint of antennæ pale yellow, with a few slender stiff black hairs; flagellum dark brown, of eleven joints, the last one very small; pubescence short, whitish, each joint with about four long stiff black hairs on upperside. *Thorax* brownish yellow, with three not very distinct darker stripes; pleuræ a little darker; scutellum and metanotum dusky. *Abdomen* brownish yellow, posterior half (approximately) of segments blackish, apical segment and genital organs wholly blackish and pubescent. Belly mainly yellowish. *Legs*: coxæ and femora yellowish, blackish towards tips; tibiæ and tarsi blackish. *Wings* grey. Upper veinlet of anterior branch of 4th longitudinal vein forked just before half its length; 4th vein forking immediately before the anterior cross-vein; the 2nd longitudinal vein beginning much before the origin of the 3rd vein, the basal part of which is in a line with the anterior cross-vein; posterior cross-vein placed at a distance about midway between the origin of the 2nd vein and the anterior cross-vein. Stigma brown, oval, at the distal end of the inner marginal cell; small but distinct dark suffusions over the origin of the 2nd vein, the basal part of the 3rd vein, and both the anterior and the posterior cross-veins. Halteres dirty black.

Length 7½ millim.

Described from one male from the Nilgiri Hills, 6000 ft., v. 1911 (*H. L. Andrewes*).

Type in the Indian Museum.

The four Indian species of *Dolichopeza* may now be separated thus:—

Anterior branch of upper branch of 4th longitudinal vein forked.	
Wings unmarked except for the stigma	*orientalis*, Brun., p. 354. / *obscura*, Brun., p. 355.
Wings with infuscations on the cross-veins	*infuscata*, Brun., p. 565.
Posterior branch of upper branch of 4th longitudinal vein forked	*posticata*, Brun., p. 564.

Subfamily LIMNOBIINÆ.

Dicranomyia subtessellata, sp. nov.

♂ ♀. Wholly blackish grey, the dorsum of the abdominal segments with the exception of the sides and posterior borders, a little dirty yellowish, the belly also somewhat of the same shade.

Genitalia in both sexes small, reddish yellow. Legs pale brownish yellow, femora a little lighter, the tips a little irregularly obscured. *Wings* nearly clear, with a ground-work of very small and extremely pale grey spots, mainly circular or roughly quadrate, and more or less arranged in longitudinal rows; a few darker spots along the costa, a rather larger blackish darkening over the marginal cross-vein, contiguous to a small ill-defined stigma, and weak, but obvious, slight infuscations over the forks of the veins, the "cross" veins (speaking broadly), and the tips of most of the veins in the distal part of the wing. Halteres small, pale yellow.

Length 5½ millim.

Described from a unique pair from Pattipola, Ceylon, 6000 ft., 14. x. 11 (*Annandale*).

Types in the Indian Museum.

This species is distinguished from *D. marmoripennis*, Brun., by the entirely dark sides of the thorax, instead of the conspicuous whitish grey sides with a broad dark lateral stripe, as in that species.

Dicranomyia bicinctipes, sp. nov.

♂. *Head* brownish yellow, antennæ and palpi dark brown. *Thorax* rather more arched than usual, brownish yellow, with a pale median line from about the middle of the dorsum, carried continuously across the scutellum to the rear of the metanotum. Sides and underside of thorax pale whitish yellow, a brown stripe between and across the anterior coxæ. *Abdomen* dark brown, the posterior part of many of the segments paler. Belly wholly whitish yellow; genitalia brown, apparently of normal structure. *Legs* pale brownish yellow, tips of femora and two narrow rings on the tibiæ, black; these rings situated just before the first and second thirds respectively; tarsi snow-white; tibiæ becoming white towards and at their tips. *Wings* cuneiform, pale grey, iridescent. Auxiliary vein ending about half-way between the origins of the 2nd and 3rd longitudinal veins; stigma large, oval, black, well defined; discal cell absent; upper branch of 4th longitudinal vein forked at one-third of its length, the veinlets parallel; posterior cross-vein in a line with the base of the 3rd posterior cell; the endings of the 2nd, 3rd, and 4th longitudinal veins approximately parallel. Halteres dirty yellow, tips darker.

Length 5 millim.

Described from three males in the Indian Museum from "Thingannyinaung to Sukli," Dawna Hills, 900–2100 ft., 23–27. xi. 11 (*Gravely*).

This species belongs to what may be termed the *saltans* group; those with cuneiform wings and snow-white tarsi, the *Thrypticomyia* of Skuse.

Dicranomyia columbina, sp. nov.

♀. *Head*: eyes almost contiguous; occiput and frons grey, antennæ also; palpi more or less blackish. *Thorax* brownish grey, apparently variable in shade; a wide median stripe from anterior margin, of varying intensity; two shorter adjacent but not contiguous side stripes, of less distinctness, and a large more or less dark oval spot on each side behind the transverse suture; the depressions in the dorsum pale yellowish. *Abdomen* blackish or dark brown, ovipositor reddish yellow. *Legs* brownish yellow; femora and tibiæ barely darkened towards the tips, knees pale, tips of tarsi darker. *Wings* very pale grey; subcostal cell a little yellowish; the 1st longitudinal vein yellowish, with four very narrow but distinct black marks, placed approximately equidistantly: the first over the humeral cross-vein, the fourth over the origin of the 2nd vein; there is a fifth, at the tip of the auxiliary vein, the base of the 3rd vein also being just perceptibly infuscated. Venation normal; halteres brownish yellow.

Length 5½ millim.

Described from three females from Peradeniya, Ceylon, 22. vii. 10 (*type*), 7. ii. 10 and 3. x. 10 (*E. E. Green*).

Type in the Indian Museum.

This species is closely allied to *D. subfascipennis*, Brun., and *punctulata*, Meij.

Dicranomyia approximata, sp. nov.

♀. *Head*: dark grey, antennæ brownish yellow, palpi blackish. *Thorax*: dorsum rather bright shining yellowish, bare; scutellum and metanotum concolorous; sides pale yellowish. *Abdomen* moderately dark brown, practically bare, emarginations of segments a little darker; belly pale yellowish. Ovipositor large, basal part pale yellowish, upper pair of valves brown, lower pair black at base, tips reddish yellow. *Legs* long; femora brownish yellow, with blackish tips; tibiæ and tarsi darker brown. *Wings* pale yellowish grey, vitreous; stigma distinctly brownish, of moderate size, but not sharply defined. Auxiliary vein ending a little beyond origin of 2nd longitudinal vein. Venation normal; halteres small and slender, black.

Length 5 millim.

Described from a single male in the Indian Museum from Ghumti, Darjiling district, 4000 ft., vii. 1911 (*F. H. Gravely*).

This species comes near *D. cinerascens*, Brun., being distinguished by the entirely yellow (not grey) thorax; by the more yellowish femora; and by the auxiliary vein ending distinctly some little distance beyond the origin of the 2nd longitudinal vein, whilst in *cinerascens* it ends exactly opposite the origin of the 2nd vein. There is also no suspicion of the slightest infuscation over any of the veins, whereas in *cinerascens* there is often a tendency to this.

Dicranomyia innocens, sp. nov.

♂ ♀. *Head*: occiput and the moderately narrow frons light grey, with some stiff black hairs. Antennæ normal, moderately dark brown; palpi dark. *Thorax* dark brownish, mainly covered with microscopic yellowish hairs. Scutellum brownish yellow, metanotum blackish, both with microscopic yellowish hairs as on dorsum and sides of thorax. *Abdomen* blackish, the dorsum of many of the segments with a tendency to paleness in their centres; some whitish hairs towards sides; belly similar to dorsum in male, pale on basal half in female. Genitalia (♂ ♀) normal, brownish yellow. *Legs*: coxæ and about the first fourth of the fore femora, and the basal half of the posterior femora, brownish yellow, the remainder of the legs dark brown. *Wings* clear grey. The 2nd longitudinal vein begins a little, but distinctly, beyond the tip of the auxiliary vein, and is bisinnate; 2nd and 3rd posterior cells subequal and each about as long as the oblong discal cell; posterior cross-vein at base of or distinctly before base of discal cell. Marginal cross-vein so slightly infuscated as to be almost imperceptible. Halteres: stems brownish yellow, knobs blackish.

Length 4–5 millim.

Described from four males and a single female from Almora, Kumaon, 18–25. vi. 11 (*Paiva*).

Types in the Indian Museum.

Gonomyia antica, sp. nov.

♂. *Head* almost wholly dark grey, varying to yellowish. *Thorax* dark grey, brownish grey or bluish grey, or of some intermediate shade, the lower margin of the dorsum often very narrowly pale yellowish. *Abdomen* brown or blackish brown, with yellow hairs; belly yellowish. Genitalia large, furnished with a pair of large black shining bifid claws. *Legs* wholly yellowish, tips of tarsi blackish. *Wings* very pale grey, iridescent. The 2nd longitudinal vein begins distinctly before middle of wing, in a rather large curve; forked at about half its length after origin of 3rd vein; the marginal cross-vein a little beyond the origin of the 3rd vein, joining the 1st longitudinal some distance before its tip; 3rd vein normal, its basal section nearly in a line with the anterior cross-vein, which is rather short; the 1st posterior cell with nearly parallel sides; upper branch of 4th longitudinal vein simple, straight, practically in a line with basal part of same vein; the lower branch widely forked at about one-third of its length; discal cell open, *coalescent with the 2nd posterior cell*; posterior cross-vein long, at base of 2nd posterior cell or nearly so; 5th, 6th, and 7th veins normal. Anal angle of wing well developed. Halteres yellow.

Length 2½ millim.

Described from a series of twelve males from Ghumti, 4000 ft., Darjiling district, vii. 1911 (*F. H. Gravely*).

Type in the Indian Museum.

In my table of species *G. antica* will be separated from *G. aperta* and *proxima* taken together by the *lower* branch of the 4th longitudinal vein being forked instead of the upper one.

Mongomioides albogeniculata, sp. nov.

♂. *Head* brownish yellow, as are also the antennæ and palpi. *Thorax* and *abdomen* brown, the latter the darker, being in one specimen nearly blackish; the posterior margins of the segments faintly pale in one specimen. Sides of thorax yellowish white; underside of abdomen yellowish, sometimes whiter towards the base. Scutellum and metanotum brownish yellow. *Legs* mainly dark brown; coxæ and base of femora whitish yellow, tips of femora and bases of tibiæ rather broadly snow-white; apical part of tibiæ (about one-third to one-half), and all the tarsi snow-white. *Wings* pale grey, unmarked; halteres blackish.

Length 5 millim.

Described from two males in the Indian Museum, labelled "3rd Camp to Misty Hollow," Dawna Hills, 400–2400 ft., 22–30. xi. 11 (*Gravely*).

The clear wings separate this species from both *M. trentepohlii*, Wied., and *marmorata*, Brun., whilst from *M. nigroapicalis*, the only other species with clear wings, it is distinguished at once by the snow-white knees.

Limnophila multipunctata, sp. nov.

Head: occiput and frons almost greenish grey, with a few stiff black hairs; proboscis and palpi dark brown. Scapal joints of antennæ large, dark brown; flagellum yellowish, normally pubescent. *Thorax* grey, anterior part more yellowish; sides pale blackish grey; scutellum and metanotum more or less concolorous with dorsum of thorax; a narrow median dark line, not very pronounced, from about the transverse suture, carried continuously over the scutellum and metanotum. *Abdomen* dark brown above, with a little pale pubescence; belly similar. *Legs* pale yellow, with comparatively long, pale yellowish white, soft hairs; a subapical rather narrow brownish ring on femora; tips of tibiæ barely darker. *Wings* pale grey; a row of very small brown spots on each side of each vein, the spots often contiguous for a short distance or those on opposite sides of a vein joined together in pairs; a row of very small dark brown spots along the costa, and a distinct small black spot at the tips of the auxiliary and 1st longitudinal veins and at both ends of the 2nd longitudinal vein; stigma brown, oval, surrounded by the brownish

suffusion which extends rather indistinctly and (apparently) irregularly along the "central cross-veins" to the hind border of the wing, by way of the posterior cross-vein and the apical section of the 5th longitudinal vein. Anterior cross-vein a little before the middle of the discal cell, the posterior cross-vein exactly at the middle; the 3rd longitudinal vein begins a short distance before the fork of the 2nd, its basal section being in a line with the anterior cross-vein; the petiole of the 2nd posterior cell distinctly shorter than the cell; the 3rd and 4th posterior cells nearly twice as long as the discal cell; all the veins on distal part of wing approximately parallel and equidistant. Halteres brown.

Length 6 millim.

Described from a single specimen from the Nilgiri Hills, 6000 ft., v. 1911 (*H. L. Andrewes*).

Type in the Indian Museum.

The sex is uncertain, owing to the tip of the abdomen being broken off. This species is easily known from the other two by the conspicuously marked wings.

Limnophila honesta, sp. nov.

♀. *Head* wholly moderately dark grey, with some black hairs above; antennæ and palpi brownish yellow. The head is rather elongate behind, and placed on a distinct neck. *Thorax* moderately dark grey, with three rather indistinct brownish stripes, the median one attaining the anterior margin; a black spot placed in a small pit-like depression behind the shoulders; sides of thorax lighter yellowish. Scutellum concolorous with dorsum of thorax; mesonotum darker. *Abdomen* moderately dark brown, with very sparsely scattered short pale hairs. Belly yellowish; ovipositor brownish yellow. *Legs* brownish yellow; coxæ and femora towards base lighter, tarsi darker. *Wings* pale grey. Anterior branch of 4th longitudinal vein simple, so that there are only four posterior cells; marginal cross-vein a little before the fork of the 2nd longitudinal vein; posterior cross-vein a little beyond base of discal cell, nearly opposite the anterior cross-vein; 2nd and 3rd posterior cells subequal, about one and a half times as long as the oblong discal cell.

Length 6 millim.

Described from one female from Almora, 5500 ft., Kumaon, 5. vii. 11 (*Paiva*),

Type in the Indian Museum.

This species is easily recognised from all other Indian ones by possessing only four instead of five posterior cells.

Eriocera cingulata, sp. nov.

♂. *Head* blackish grey, the subconical protuberance on the frons apparently bisected in front, and with a little grey sheen below. The 1st scapal joint of the antennæ long, black, the 2nd

annular, with yellowish tip; flagellum of apparently only five yellowish joints; palpi black. *Thorax* all black, except the dorsum, which is rich dark reddish brown, with a little sparse short dark hair. Scutellum, metanotum, and sides of thorax black. *Abdomen* dull black; basal half or two-thirds of shining lead-colour, much resembling *E. plumbicincta*, Brun. Genitalia bright reddish orange. *Legs*: coxæ black, femora yellowish except for the narrowly black tips; remainder of legs dark brown, tips of joints just perceptibly black. Legs apparently bare, owing to the microscopic nature of the pubescence. *Wings* black, axillary and spurious cells dark grey; a roughly oblong clear spot, with a distal triangular projection about its middle, placed transversely at about three-fourths of the length of the basal cells, extending across both of them; a small circular white spot at about two-thirds the length of the inner marginal cell; a very small apical white spot extending over the tips of both of the submarginal cells and the 1st posterior cell. Five posterior cells; the uppermost branch of the 4th vein forked; anterior cross-vein just before the middle of the discal cell; posterior cross-vein at middle of discal cell. Halteres black.

Length 12 millim.

Described from a unique male from Ghumti, 4000 ft., Darjiling district, vii. 1911 (*F. H. Gravely*).

Type in the Indian Museum.

This species will come in my table between the two groups containing (1) *rufithorax*, Brun., *fenestrata*, Brun., and *scutellata*, Edw.; and (2) *humberti*, Os. Sac., and *meleagris*, Os. Sac. These groups are distinguished for the sake of convenience by the relative lengths of the species, the first being those of 15 to 20 millim. in length, the second those of 7 to 10 millim. long. *E. cingulata*, being 12 millim. in length, is intermediate, but may be distinguished from all these, except *E. fenestrata*, by the dorsum *only* of the thorax being red instead of the whole thorax. From *fenestrata* it is separated by having five, not four, posterior cells, and by the presence of a small clear apical spot on the wing.

Eriocera nigerrima, sp. nov.

♀. *Head* wholly blackish grey. Antennæ black, with seven joints to the flagellum; palpi black, the joints rather thick and strongly pubescent. Frons with a moderate-sized subvertical hump, and a transverse protuberance below it. *Thorax* dark grey, with three black contiguous stripes of which the median one attains the front margin; shoulders moderately dark grey; collare distinct. Dark grey pubescence about the shoulders, and a row of black hairs on each side of the median stripe. Scutellum and metanotum black; pleuræ moderately dark greyish, with black and grey hairs. *Abdomen* black above, almost dull and almost bare, unmarked; belly similar. Ovipositor bright reddish orange. *Legs* all black,

with microscopic pubescence. *Wings* dark brown, axillary and spurious cells a little paler; a clear, irregularly oval spot lying across the basal cells towards their tips, its upper corner just encroaching on the inner marginal cell. Four posterior cells; anterior and posterior cross-veins placed just before the middle of the discal cell. Halteres black.

Length 12 millim.

Described from a single female from Ghumti, 4000 ft., Darjiling district, vii. 1911 (*Gravely*).

Type in the Indian Museum.

In my table of species *E. nigerrima* will be separated from *E. aterrima* by the clear oval spot in the middle of the wings.

Eriocera triangularis, sp. nov.

♂. *Head* black, with black hairs, the frontal hump fairly conspicuous. Antennæ with six flagellar joints, black, pubescent. *Thorax* wholly black, with black pubescence; a little greyish below the shoulders and about the sutures. Scutellum and metanotum wholly black; pleuræ dark grey. *Abdomen* black, the 2nd to the 5th segments ochraceous yellow, with a triangular black mark on the posterior border of each, the apex reaching to the middle of the segment, from which it is carried anteriorly in a dorsal line or in the form of a row of two or three spots; the 6th segment a little yellow on each side at the base; the yellow segments bearing a very narrow lateral black line. Genitalia black. *Legs* wholly black. *Wings* wholly coffee-brown, the axillary cell barely lighter. Four posterior cells; posterior cross-vein beyond the middle of the discal cell. Halteres black.

Length 21 millim.

Described from two males in the Indian Museum from the Nilgiri Hills, 6000 ft., v. 1911 (*H. L. Andrewes*).

In my table of species of *Eriocera*, this species will come with *E. albonotata*, Lw., and *testacea*, Brun., being distinguished from them by the wholly black legs.

On Labelling Diptera for the Cabinet.

Labelling specimens for the cabinet is a very important matter, since a precisely dated and localised collection of well-preserved uniformly mounted insects is of much superior value to one in which the localities given are vague or indefinite. The widest record that should be allowed in a standard collection is the month of capture, county (or province, etc.), with an abbreviation of the country, such as "June, Sussex, Engl.," or "vii, Orissa, India." Care must be taken in making abbreviations to avoid confusion; for instance, Middlesex and Surrey are counties in Jamaica as well as in England, and there are scores of towns bearing well-known English names in Canada, the United States, Australia and elsewhere. Moreover, each of the American States has its definitely accepted abbreviation and these must be adopted without change. The student should always label specimens so that if they ultimately find their way into a general collection of Diptera there may be no ambiguity as to their origin.

The more complete the data the more scientific value has the collection, but little exception can be taken to the first and last day only being given of a short period, as "3–10. viii. 07," "1st week. viii. 09." I have been accustomed, when not more than three days collecting has to be labelled, to date all the specimens for the middle day, because a single day can make no material difference in the appearance of a species, and if the specimens be numerous the saving of time is worth more than the minute precision.

It is desirable that the date should be written in the logical sequence of day, month and year; and if the month is indicated by figures, which is the more preferable method, it is of importance that Roman numerals should be used for it (the day and year being in Arabic), in order to prevent any possible confusion between the day and the month.

Printed labels are always to be preferred to written ones; they are more legible, do not fade so quickly, and are usually more compact, but the date may be written in by hand if more convenient, care being taken to write clearly. Additional information is always welcome, such as "on sunny bushes," "salt marsh," "sea shore," etc., or still more precise details peculiar to the species, as, "in aerial dances under trees at sunset," "on underside oak leaves at dusk"; or if the species is especially partial to a certain kind of plant, the name of the latter may advantageously be added.

Again, collectors' names should invariably be written sideways to the rest of the data, so that they may be recognised as such. The collector's name, if the latter be well established, is a valuable asset in the opinion of most entomologists.

Specimens named by specialists should be so labelled, the customary contraction being "det. Kertész," "det. F. W. Theob." and so on; and on the *same label* should be written the name of the species, and, if confirmed by the specialist, other data such as sex, type, co-type, etc. A separate label should be used for "Jones coll.," "Brown coll.," etc.

Regard must be had to the size and nature of the labels. White stiff paper only should be employed, a variety of colours to designate zoological distribution destroying the general effect of a collection, and they should be cut as small as conveniently possible, according to the size of the insect, and should always be attached *face uppermost* so that the information can be read without removing the specimen. In the case of copious details, two or more labels must be employed; large, unwieldly labels must be avoided, and especially folded labels, except in very special instances. The uppermost label should bear the date and locality, with the collector's name placed sideways; further details, if provided, on a second label, the name of the species on a third, and (if desired) the name of the collection on a fourth; but space must be left beneath the lowermost label to enable the forceps to grasp the pin. All the labels should be placed so as to be read from the right-hand side of the insect.

It is hardly necessary to add that any system of numbers only or hieroglyphics, bearing reference to a catalogue for details, is entirely out of the question, as the catalogue once lost, the collection loses a great part of its value.

In arranging specimens in the cabinet, divide a drawer of 16 or 18 inches square into five or six vertical columns by means of pencilled lines and then place in each column the males to the left and the females to the right, two or three of each side by side in a horizontal row, following with successive rows till the series of that species is exhausted, under which place the specific name, with its author. Generic names are placed at the top of each column. The plan of thus dividing the sexes greatly facilitates reference.

Some preservative is necessary to prevent mites and mould from ruining one's collection, and in temperate climates camphor or naphthaline keeps away the former and a little carbolic acid or creosote on cotton wool prevents the latter. In tropical climates a collection of Diptera is extremely liable to mould during the long rainy season and requires constant attention.

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PLATE I.

MYCETOPHILIDÆ.

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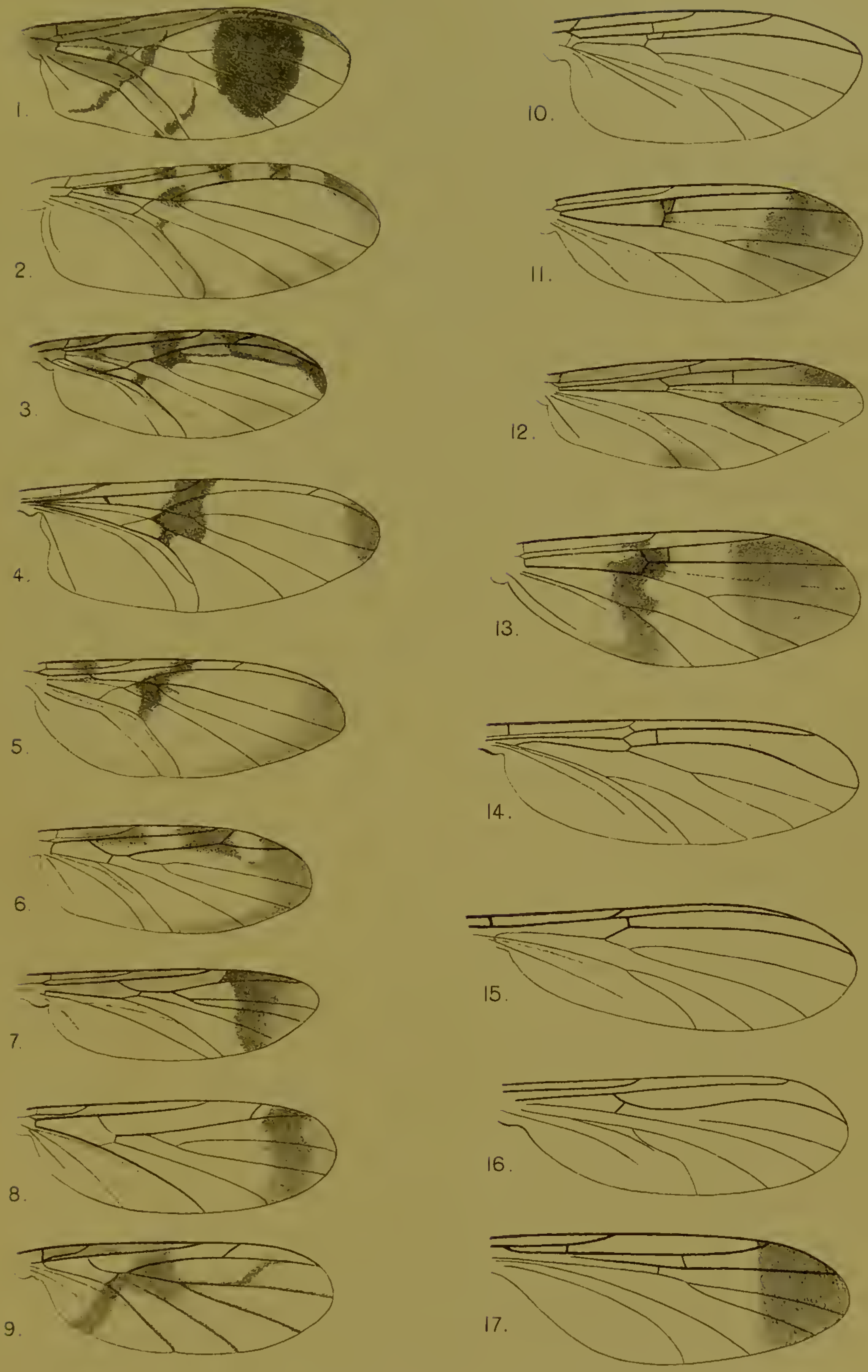

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MYCETOPHILIDÆ.

PLATE II.

Mycetophilidæ.

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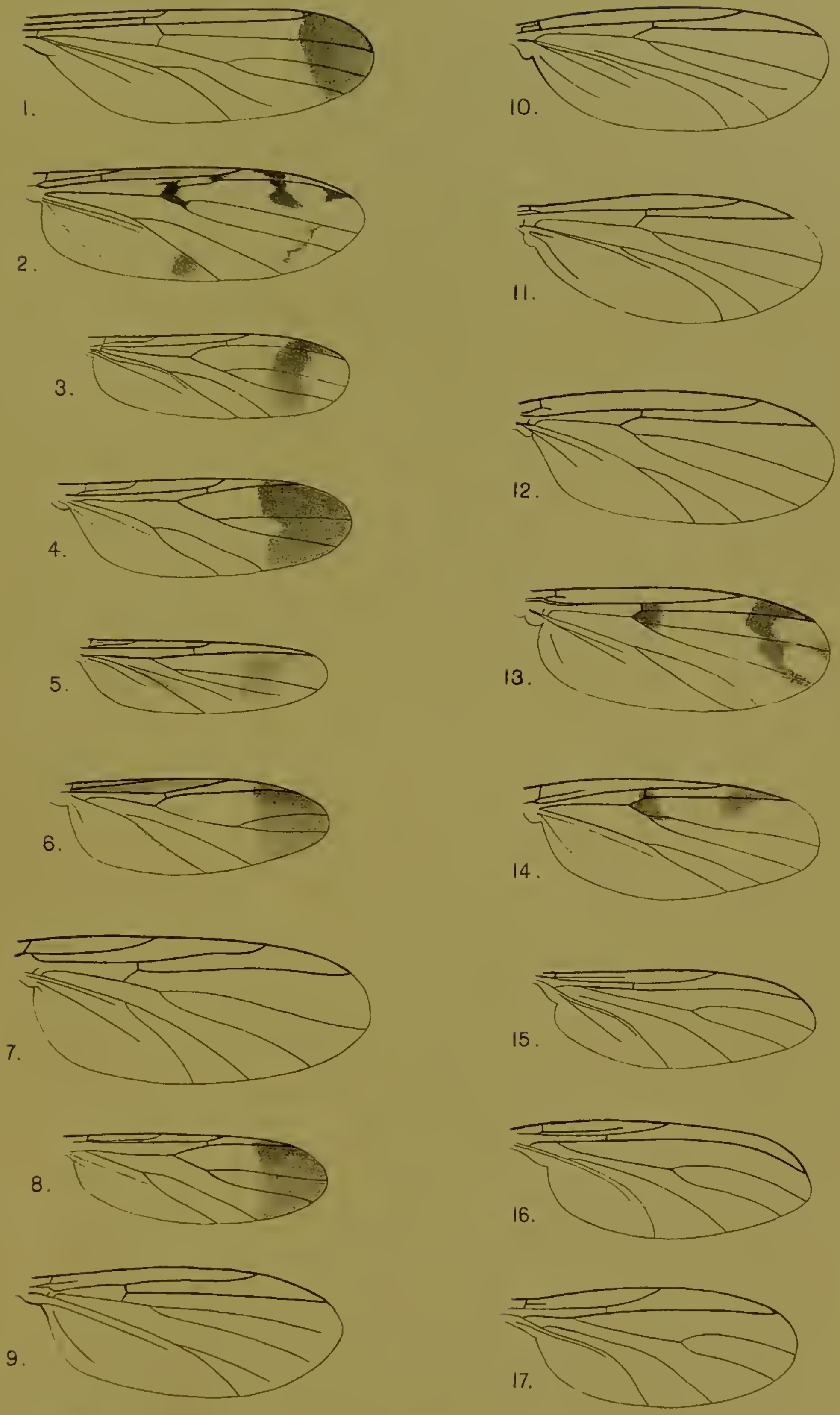
*16. ,, ,,
*17. ,, ,,

* Three typical forms of venation in *Sciara*.



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MYCETOPHILIDÆ.

PLATE III.

MYCETOPHILIDÆ.

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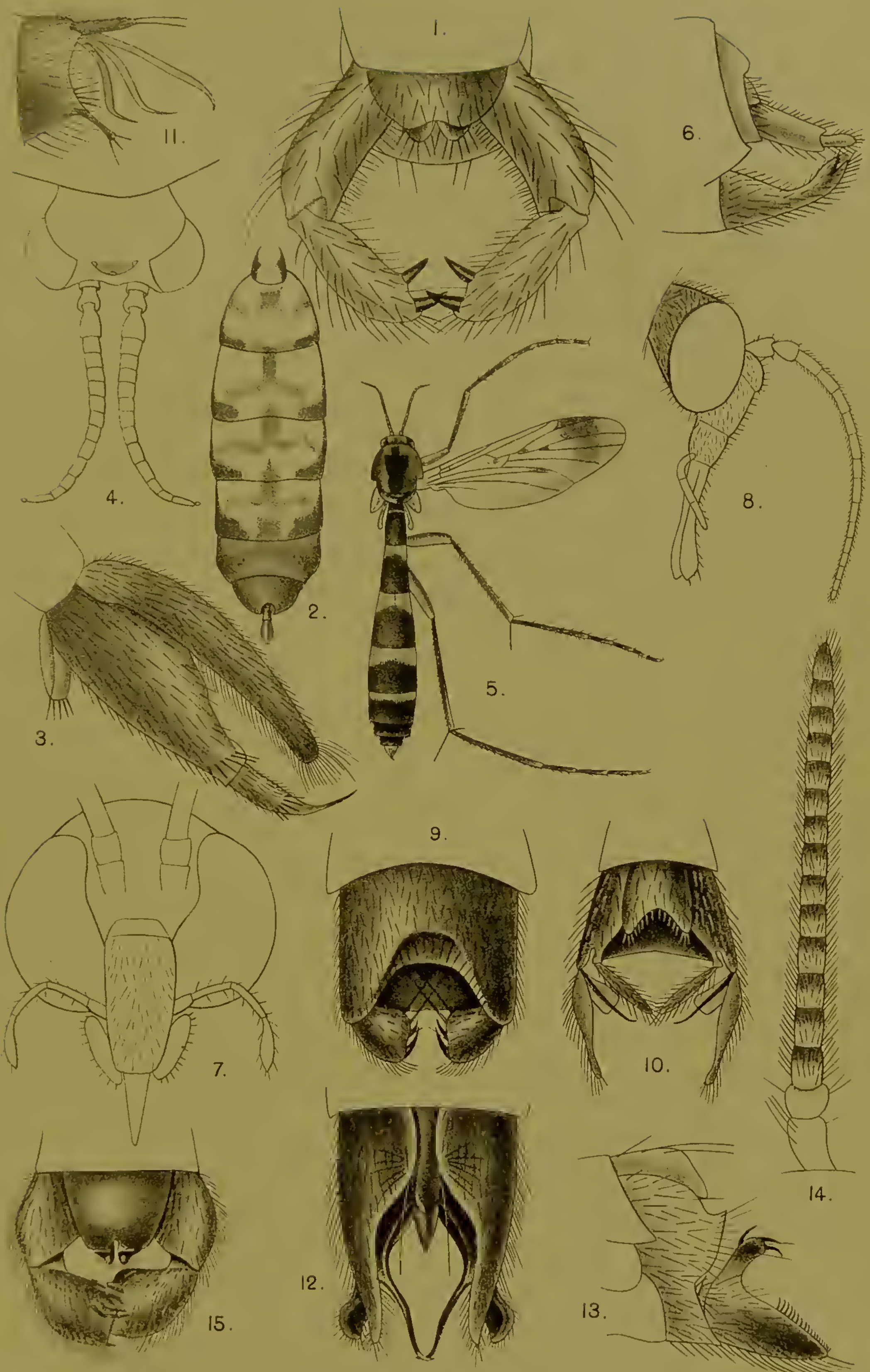

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MYCETOPHILIDÆ.

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PSYCHODIDÆ.

PLATE V.

TIPULIDÆ.

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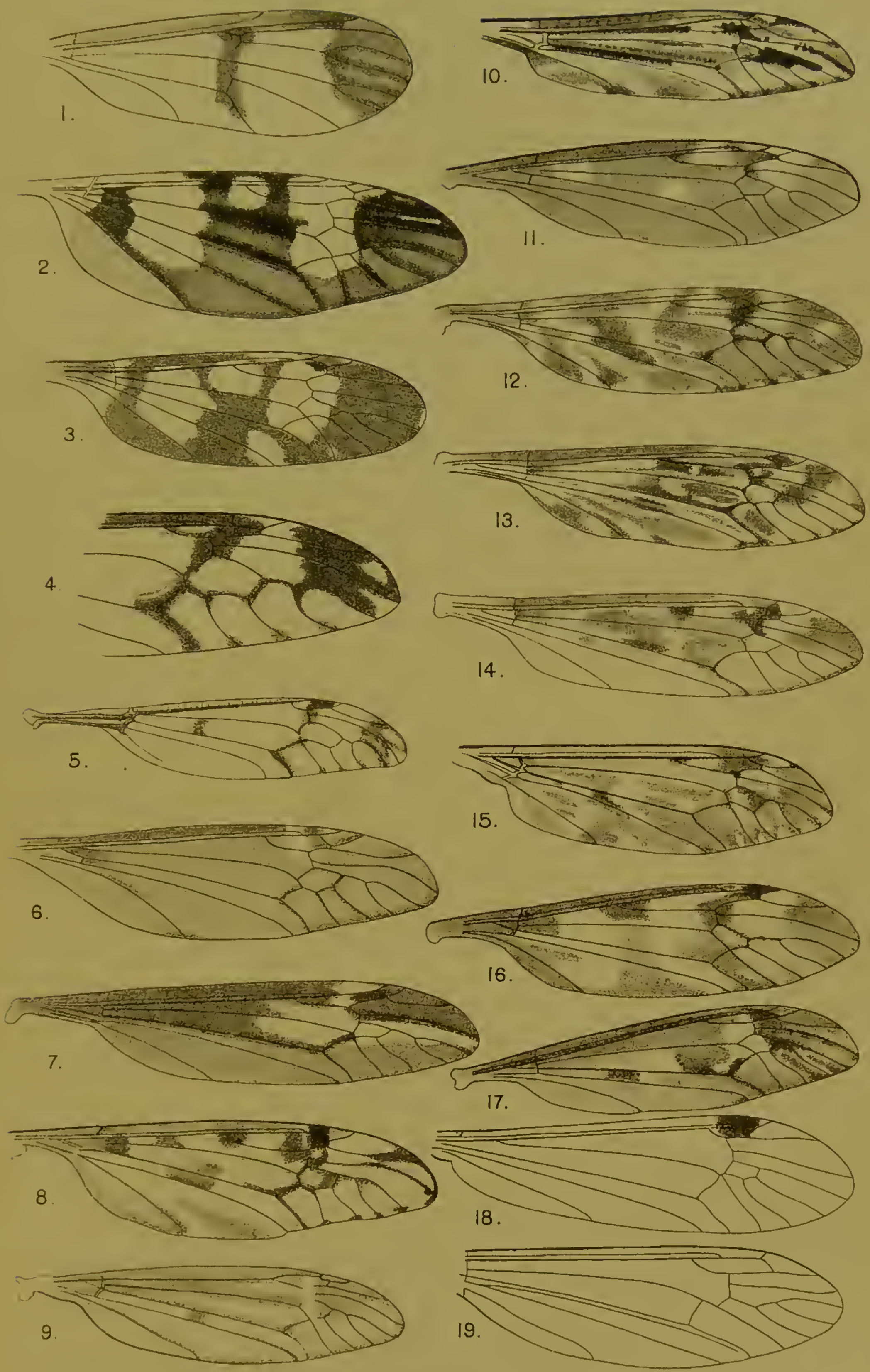
* The reference in the text is erroneously given as fig. 13.



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TIPULIDÆ.

PLATE VI.

Tipulidæ.

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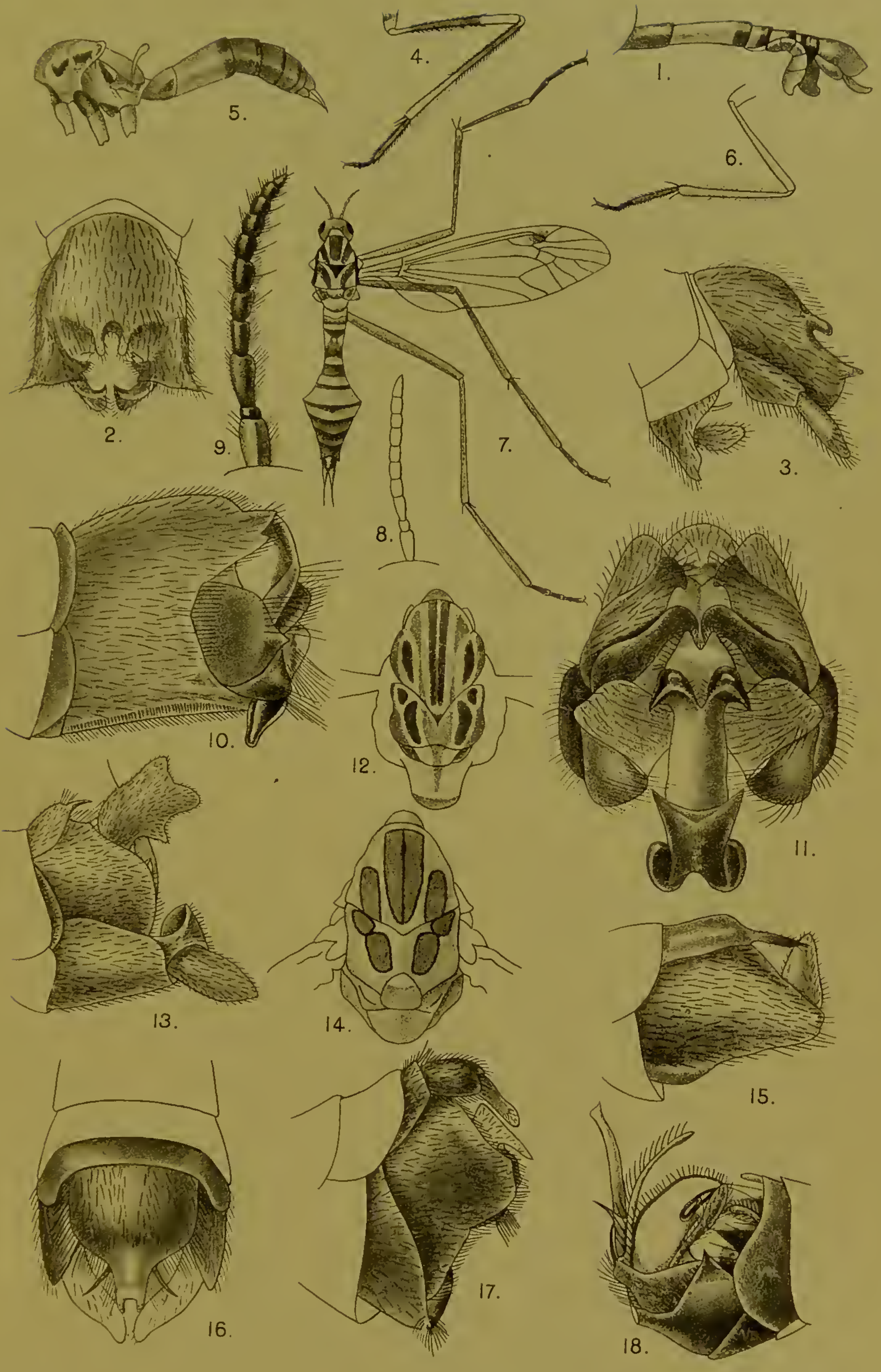

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TIPULIDÆ.

PLATE VII.

Tipulidæ.

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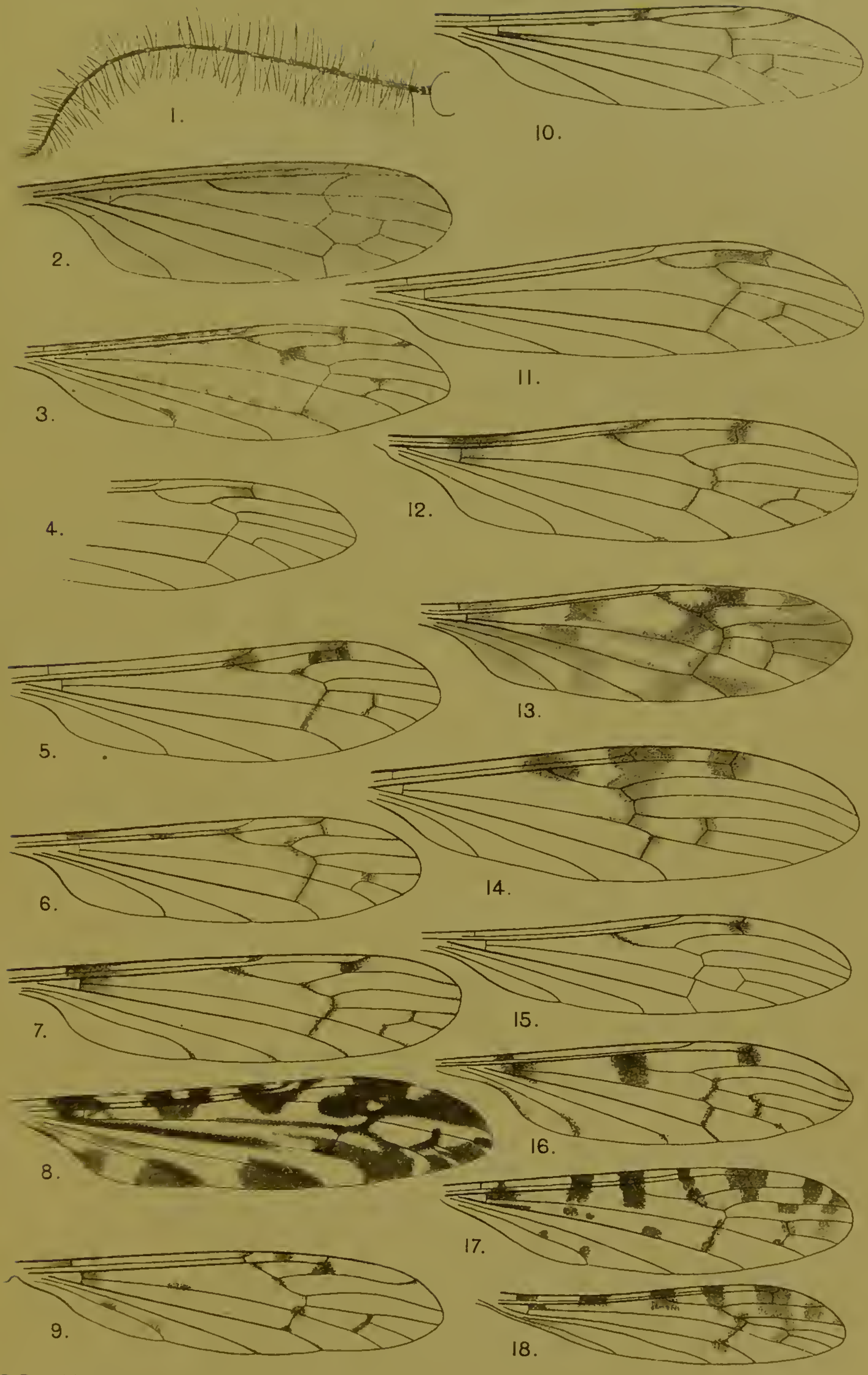
* The reference in the text is erroneously given as fig. 2.



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TIPULIDÆ

PLATE VIII.

Tipulidæ.

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5. *Libnotes fuscinervis*, sp. n., p. 411.
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7. ,, *notatinervis*, sp. n., p. 412.
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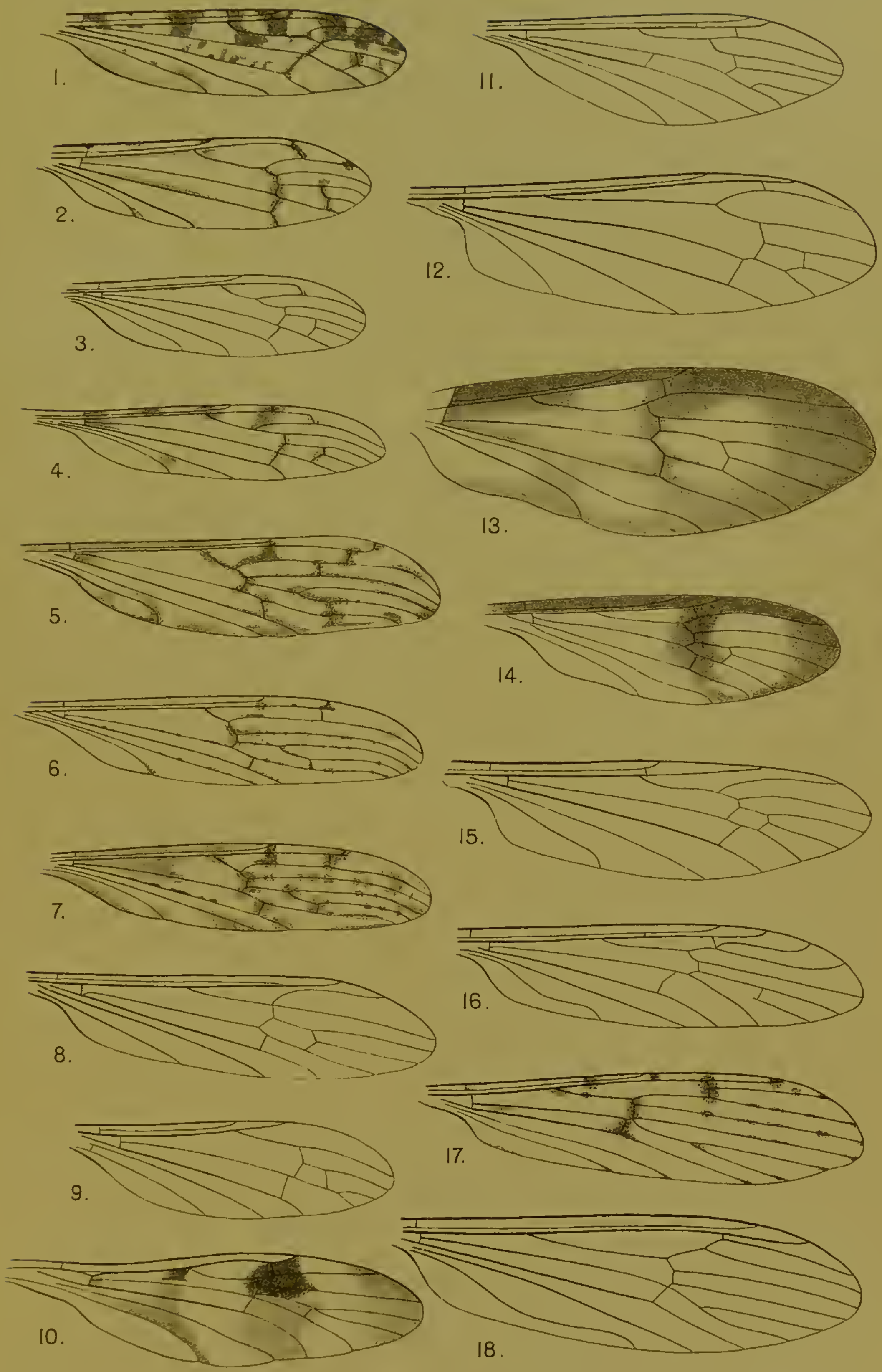

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PLATE IX.

TIPULIDÆ.

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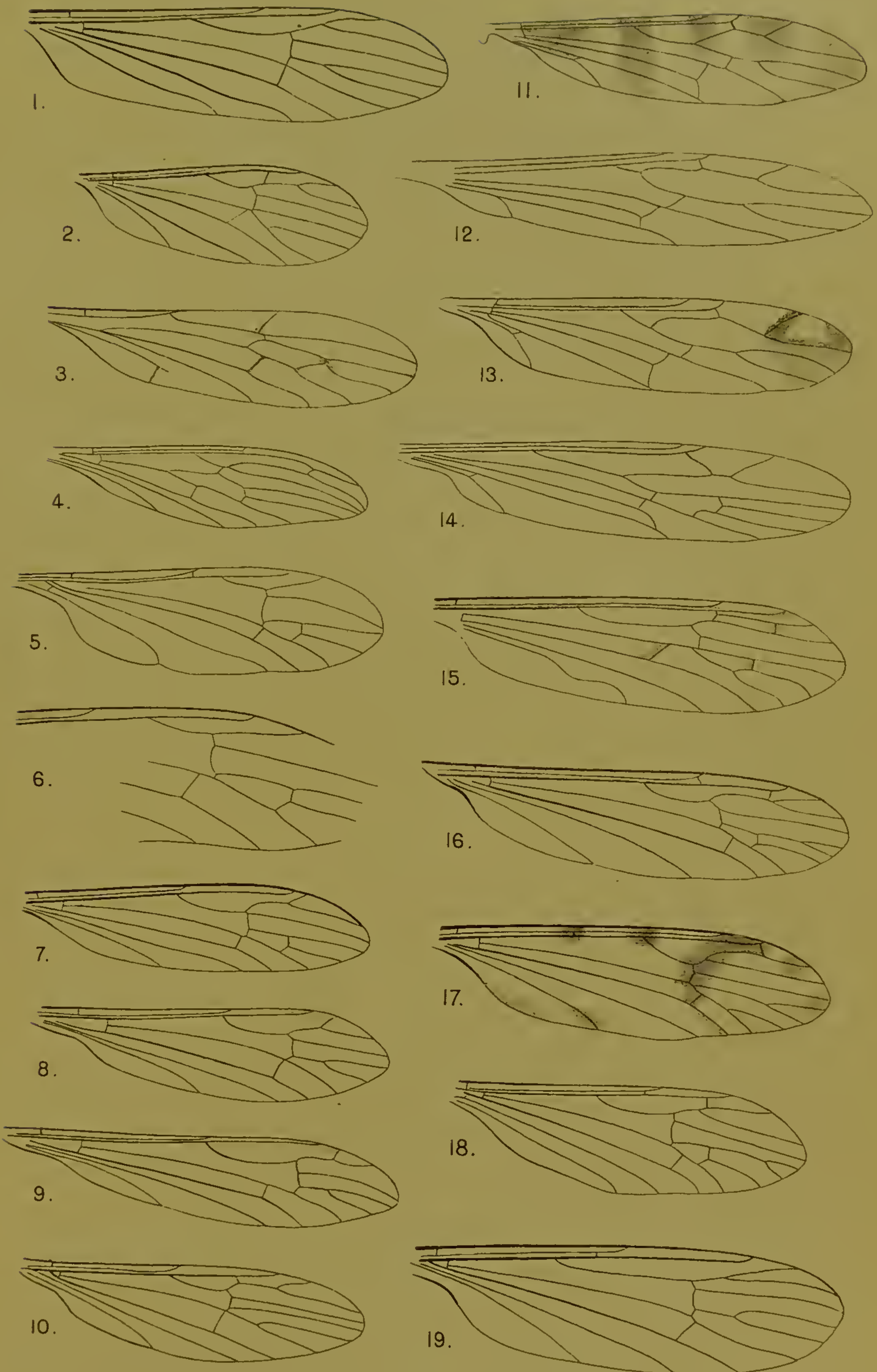

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TIPULIDÆ.

PLATE X.

Tipulidæ.

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8. ,, ,, antenna.
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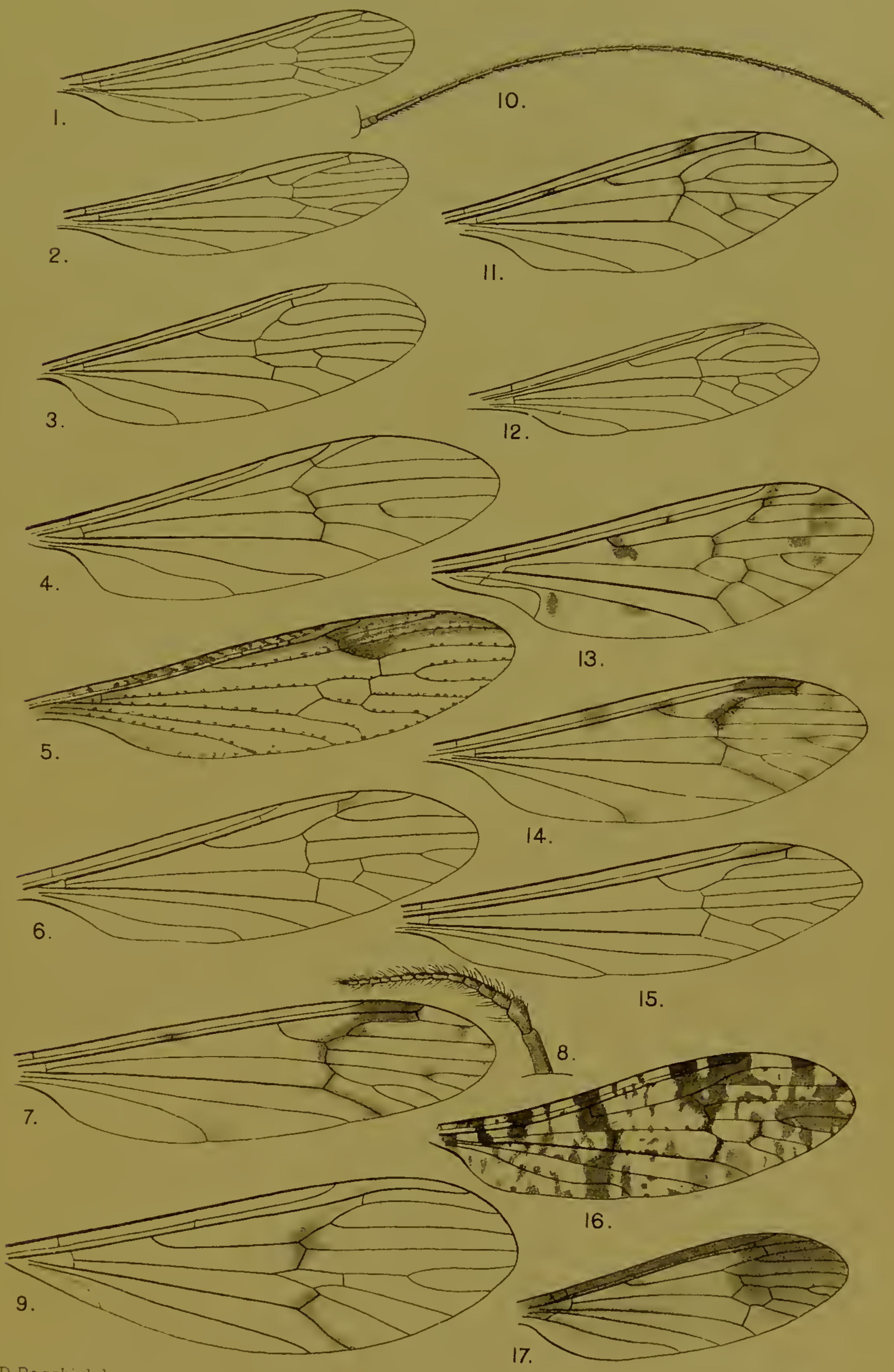

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TIPULIDÆ.

PLATE XI.

TIPULIDÆ.

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11. *Rhamphidia ferruginosa*, sp. n., ♂ genitalia, side view; [p. 418.
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TIPULIDÆ.

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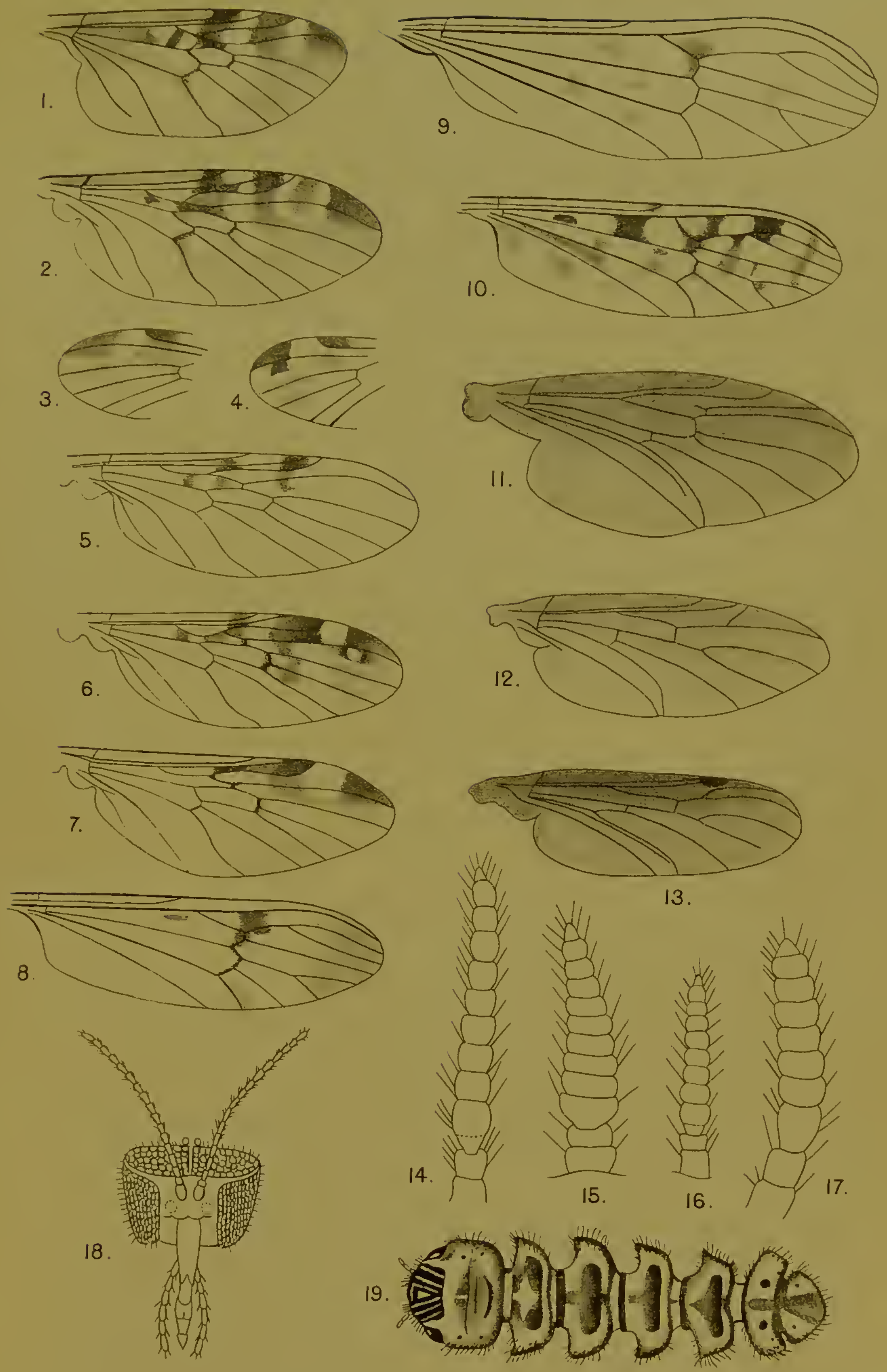
‡19. ,, larva.

* The apical joint should be considerably more elongate in the figure.

† There are 8 annular joints in the flagellum, not 7, as shown in the figure.

‡ These two figures are reproduced from the 'Genera Insectorum,' Fasc. 56, Blepharoceridæ, by Prof. V. L. Kellogg.



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